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THE RÔLE OF THE PANCREATIC JUICE IN THE PRODUCTION OF GALL-BLADDER DISEASE[1]

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A CAREFUL study of the pathological findings in gall-bladder disease encountered either in the operating room or on the autopsy table often suggests the possibility of an unknown etiological factor. Moreover, the clinical history often suggests a factor which must, by nature of its sudden and rapid action, be more than an inflammatory process. This is especially true in cases of acute gangrenous cholecystitis and in some cases of acute phlegmonous cholecystitis in which the gall bladder yields sterile cultures. Clairmont and Haberer have described cases of non-perforative biliary peritonitis; Schultze suggested a disturbance such as is associated with acute pancreatic necrosis, and Walzel, having in mind the work of Blad and Schoenbauer, suggested that the pancreatic juice might be the active factor since he was able to demonstrate the presence of pancreatic ferments in the gall-bladder contents in a case of acute phlegmonous cholecystitis.

In 1928, I was asked to operate upon a patient who was suffering from an attack of subacute pancreatitis. In this case the gall bladder was distended, the wall was œdematous and much thickened, the serosa was a dusky cyanotic red and in every way it gave the gross appearance of an acute phlegmonous cholecystitis. The microscopical examination of the organ verified this diagnosis but cultures taken from the gall-bladder wall and the contents of the gall bladder were sterile. The picture was so obviously one of acute inflammation that I began to speculate as to a possible cause for an aseptic phlegmon of the gall bladder. The reference by Walzel, which had just come to my attention, was recalled and stimulated me to a further study of the subject.

When I began my experiments in January of 1929 I was not acquainted with the studies of Blad, Schoenbauer, Westphal, and others. My experiments were gradually developed in an effort to determine whether pancreatic juice, if conveyed into the gall bladder of the dog, would produce pathological changes in the wall of the gall bladder. It is a known fact that pancreatic juice will attack living tissues under favorable conditions as exemplified in the widespread digestion of the abdominal wall in cases of pancreatic and duodenal fistulæ; therefore, it seemed plausible to me that if pancreatic juice came in contact with the gall-bladder wall it might produce pathological changes not unlike those seen at times on the operating table.

EXPERIMENTAL STUDY

Our experimental work was carried out on the dog, all animals being operated upon with the animal under ether anæsthesia, strict aseptic technique being employed. The experiments can be divided into five groups: (1)

[1] From the Laboratory of Surgical Research, Northwestern University, Chicago. Read before the Chicago Surgical Society, December 5, 1930.

a single injection of pancreatic juice into the gall bladder through a hypodermic needle; (2) multiple injections of pancreatic juice into the gall bladder through a cholecystostomy tube; (3) a single injection of pancreatic juice into the cystic duct through a hypodermic needle; (4) a single injection of pancreatic juice into the common duct through a hypodermic needle; (5) the continuous introduction of pancreatic juice into the common duct by means of special preparations. The pancreatic juice employed in these experiments was obtained by cannulating the major pancreatic duct of the dog and collecting the juice in a rubber bag.

Group 1. A single injection of pancreatic juice into the gall bladder through a hypodermic needle. Eight animals were subjected to this procedure. The usual technique was to open the abdomen through a right paramedian incision, the gall bladder being delivered and a pursestring suture of fine silk placed at the apex of the viscus. A fine hypodermic needle was introduced and from 10 to 20 cubic centimeters of bile was aspirated and a like amount of pancreatic juice was injected, no force being used. The pursestring suture was drawn taught and tied as the needle was withdrawn thus preventing leakage of the contents of the gall bladder. The abdomen was closed in four layers. Two of these animals died during the first 3 days, the cause of death being acute peritonitis with bile stained bloody fluid in the peritoneal cavity with no gross leakage from the gall bladder. Specimens were taken from the others at varying periods of time up to 67 days after the procedure (Dogs 7, 8, 9, 15, 18, 19, 21, 22).

Group 2. Multiple injections of pancreatic juice into the gall bladder through a cholecystostomy tube. There were only two animals in this group because we believed that the trauma incident to this procedure would add a factor which would be difficult to evaluate in forming final conclusions. The operation was performed as in the human, care being taken to prevent possible leakage about the tube. One animal, dog 6, was killed 27 days after the operation having received six injections of 20 cubic centimeters each of pancreatic juice at 24 hour intervals beginning on the day of the operation. At the conclusion of the experiment the animal was apparently in good condition. Dog 16 died 3 days after the operation having had three daily injections of 20 cubic centimeters each of pancreatic juice, the first being on the day of the operation.

Group 3. A single injection of pancreatic juice into the cystic duct through a hypodermic needle. Only two animals were subjected to this procedure, for, because of the danger of leakage from the puncture wound in the duct, it seemed impossible to close the puncture wound without danger of obstructing the duct. Both animals died within 24 hours after the operation. In dog 17, 15 cubic centimeters of pancreatic juice was injected into the cystic duct after a like amount of bile had been aspirated. Due to leakage from the puncture wound an attempt was made to place a purse-string suture about the opening but at autopsy after separating adhesions a leak was encountered. In dog 20, after aspirating 15 cubic centimeters of bile a like amount of pancreatic juice was injected and due to leakage a fine silk pursestring ligature was necessary. At autopsy it appeared that the ligature obstructed the cystic duct.

Group 4. A single injection of pancreatic juice into the common duct through a hypodermic needle. There were only two animals subjected to this procedure because of the persistent leakage from the puncture wound. In dog 14 after aspirating 10 cubic centimeters of bile from the common duct, 20 cubic centimeters of pancreatic juice was introduced. It was noticed that the gall bladder was moderately distended after this procedure. This animal died on the fifth day after operation. Dog 23 after having had 15 cubic centimeters of pancreatic juice injected into the common duct, died within 24 hours. In this animal it appeared at autopsy that the common duct had been obstructed by the ligature which had been placed to prevent leakage.

In this group may be placed dog 1. In this experiment a T tube was placed in the common duct and 22 days after the operation daily injections of 20 cubic centimeters each of pancreatic juice were made for a period of 6 days. Nine days after the last injection the animal was killed. At this time the animal

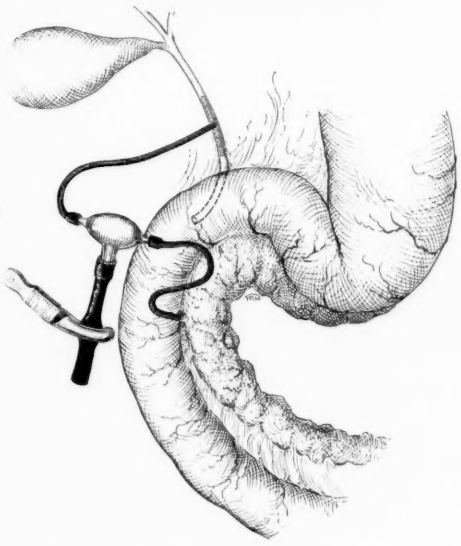

Fig. 1. Choledocho-pancreatic intubation. A drawing to illustrate the T tube in the common duct and a cannula in the pancreatic duct. The two tubes are connected by an observation glass bulb which is outside the abdominal cavity.

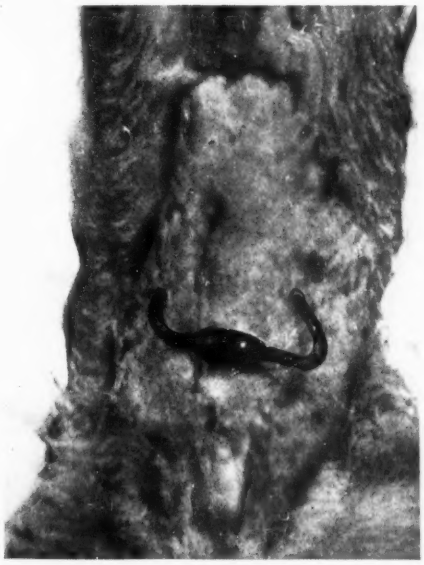

Fig. 2. A photograph depicting the external connection in Figure 1. The tube on the left side of the abdominal wall connects with the pancreatic duct; the one on the right with the common duct. They are joined by the observation bulb.

was markedly emaciated and very weak. At autopsy the duodenal end of the T tube was found occluded and the duct completely stenosed at this point.

Group 5. The continuous introduction of pancreatic juice into the common duct by means of special preparations. It seemed that none of the four methods so far employed were free from error so far as determining the effect pancreatic juice had on the gall bladder. Trauma to the gall bladder could not be excluded as a distinct factor in the production of possible pathological changes in the gall bladder; moreover, we did not believe that one injection of pancreatic juice would constitute a fair test as to the possibility of its producing pathological changes. It was calculated that if pancreatic juice found its way into the gall bladder of the human, it would most likely be introduced into the terminal end of the common duct and from there ascend in the common duct to the gall bladder. Furthermore, it seemed likely that the pancreatic juice would be introduced into the common duct in relatively small amounts, intermittently over a period of time.

With these conditions and theories in mind a new series of experiments were planned. The

Fig. 3. Photograph of gall bladder of dog 56 in which black India ink had been placed in observation bulb in a choledocho-pancreatic intubation. Appearance 5 days after operation. Upper left shows filter paper; lighter color due to gall-bladder bile, black area in center due to black ink.

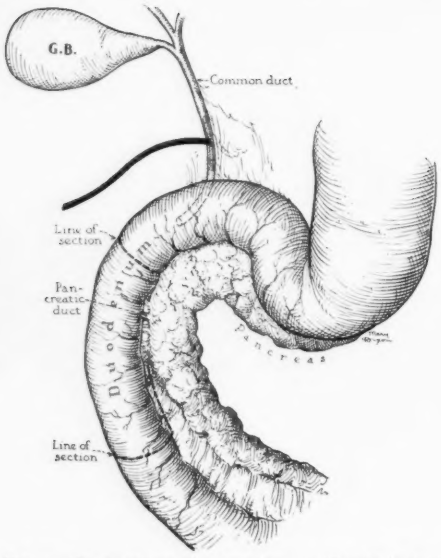

Fig. 4. Duodenal pouch operation. A T tube is in the common duct and the lines of section of the duodenum are marked.

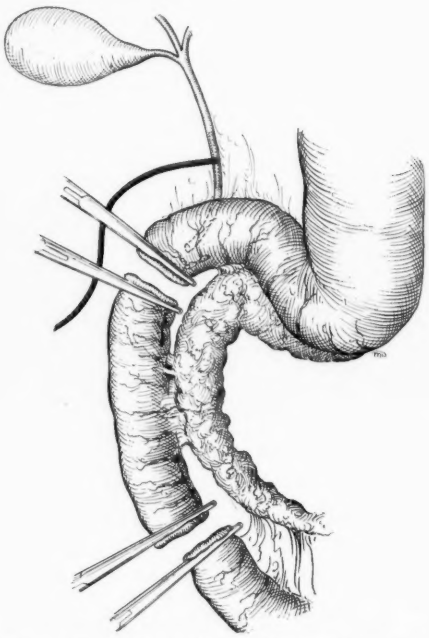

Fig. 5. Duodenal pouch operation. The pancreas is partially freed from the duodenum and the duodenum sectioned so that the orifice of the common duct is not compromised when the intestinal tract is re-established. The pancreatic duct opens into the pouch.

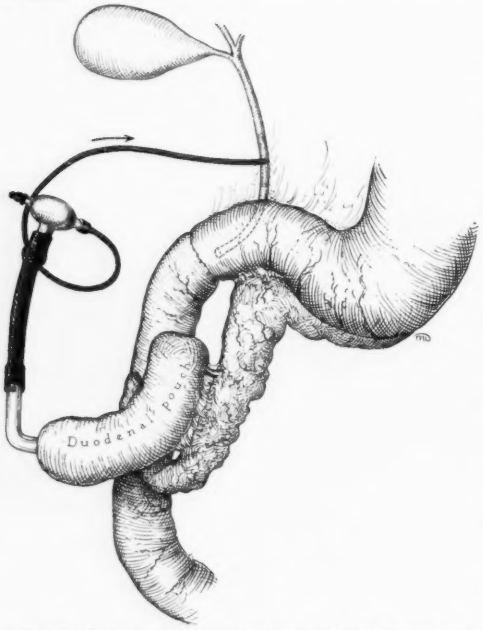

Fig. 6. The intestinal tract is re-established by an end-to-end anastomosis. The duodenal segment is closed at the proximal end and cannulated at the distal end. The tubes are connected as in a choledocho-pancreatic intubation.

first preparation we called a choledocho-pancreatic intubation. The abdomen of the dog was opened through a right paramedian incision and a T tube placed in the duodenal end of the common duct. The major pancreatic duct was then isolated and freed. A small glass cannula attached to a rubber tube was fastened into the orifice of the pancreatic duct as in making a pancreatic fistula for obtaining pancreatic juice (Fig. 1). The pancreatic tube was brought out of the abdomen through a small stab wound on the left side of the abdomen and the common duct tube through a similar wound on the right side. The midline incision was then closed in the usual manner. The two tubes were then connected by means of a glass connecting bulb (Fig. 2). This bulb afforded a means of determining whether the tubes remained patent and whether a flow was present. Since Harms and Dragstedt[1] have

[1] Dragstedt performed his experiments after my preliminary report before the Chicago Surgical Society. See L. R. Dragstedt, The Pathogenesis of Acute Pancreatitis (7).

Fig. 7, left. Photomicrograph of wall of gall bladder of dog 17 which died 1 day after the injection of 15 cubic centimeters of pancreatic juice into the cystic duct. The wall is much thickened, 4 millimeters, and shows diffuse necrosis with œdema. No viable structures can be seen nor can any structures be identified. ×30.

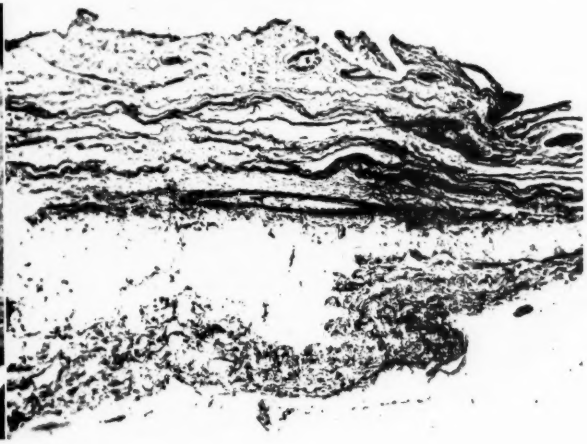

Fig. 8. Photomicrograph of the wall of the gall bladder of dog 33 which died 1 day after a choledocho-pancreatic intubation. There is complete necrosis but it is possible to identify the several layers of the gall-bladder wall. The wall was but little if any thickened. ×48.

Fig. 9, left. Photomicrograph of gall-bladder wall of dog 9 which was killed 20 days after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder. The mucosa is necrotic and parts sloughed away. The section shows an extensive infiltration of the inflammatory cells into the submucosa and muscular layers. The serosa is also infiltrated and very much thickened. ×75.

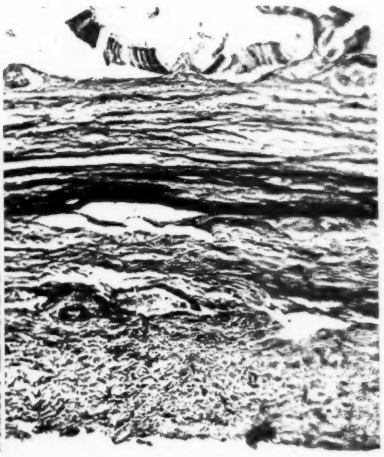

Fig. 10. Photomicrograph of the gall-bladder wall of dog 56 which died 6 days after a choledocho-pancreatic intubation with black ink in the observation bulb. This is a section of the gall bladder shown in Figure 3. The animal was autopsied immediately after death. Shows widespread necrosis with thickening of the serosa with œdema. Fragments of the mucosa can still be seen and there is some inflammatory cell infiltration of the serosa. ×45.

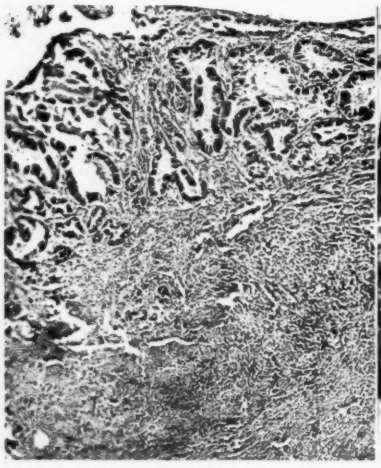

Fig. 11, left. Photomicrograph of wall of gall bladder of dog 16 which died 3 days after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder. The mucosa is hyperplastic and shows evidence of necrosis. The other layers which are considerably thickened also show extensive necrosis. ×30.

Fig. 12. Photomicrograph of the serosa of the gall bladder of dog 48 which died 7 days after choledocho-pancreatic intubation. On the left can be seen a dilated blood vessel with perivascular infiltration. There is present extensive necrosis with œdema and some cellular infiltration. ×165.

shown that the pancreatic secretory pressure is greater than that of the biliary system we believed that the flow would be from the pancreas to the common duct. This we found to be true in every case in which the tubes or cannulas remained unobstructed. Twenty-seven animals were subjected to this procedure. The question to arise now was whether the pancreatic juice which was conducted into the terminal end of the common duct would pass directly into the duodenum and thus not come in contact with the gall bladder or would find its way into the gall bladder from time to time. Many tests using the starch-iodine method were made on the contents of the gall bladder in an effort to determine the presence of amylase. But due to the confusing color reactions from iodine and biliary pigment contact we could never be assured of a positive reaction. In order to determine definitely whether the pancreatic juice thus conveyed into the common duct would find its way into the gall bladder, the observation bulb was filled with India ink at the time of the operation. Black and red ink were used. It was found that as early as 48 hours after such an operation the observation bulb would contain clear pancreatic juice. It was our belief that the ink would stain the tissues with which it came in contact and therefore our animals were allowed to live from a few days to 2 weeks. The first animal, dog 49, was autopsied 14 days after the operation in which black ink was used. The

Fig. 13. Photomicrograph of the wall of the gall bladder of dog 8 which died 24 hours after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder. There is beginning lymphoid hyperplasia of the mucosa with inflammatory cell infiltration. The infiltration extends into the muscular layer. The serosa is much thickened with œdema and infiltration. ×35.

Fig. 14.

Fig. 14. Photomicrograph of the wall of the gall bladder of dog 27 which came to autopsy 6 days after a choledocho-pancreatic intubation. The mucosa is hyperplastic with lymphoid hyperplasia. The muscular layer is thickened but not so much as the serous. There is extensive inflammatory cell infiltration of all the layers. ×25.

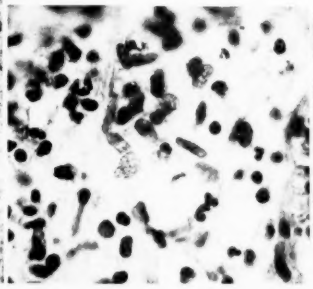

Fig. 15.

Fig. 15. Photomicrograph showing leucocytic infiltration into the stroma of the mucosa. Gall-bladder wall of dog 58 which was killed 7 days after choledocho-pancreatic intubation. ×440.

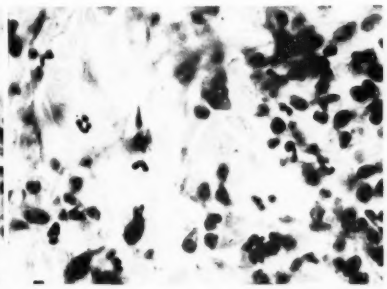

Fig. 16.

Fig. 16. Photomicrograph showing inflammatory cell infiltration into the serosa. High power of Figure 14.

Fig. 17.

Fig. 17. Photomicrograph of the wall of the gall bladder of dog 62 which was killed 33 days after a choledocho-pancreatic intubation, the tubes being in place for 10 days. There is extensive lymphoid hyperplasia with hyperplasia of mucosa and some thickening of muscular layer. ×13.

Fig. 18.

Fig. 18. Photomicrograph of the wall of the gall bladder of dog 61 which was killed 21 days after a choledocho-pancreatic intubation. The vessels are engorged and there is some hyperplasia of the mucosa. High power shows inflammatory cell infiltration of mucosa. ×35.

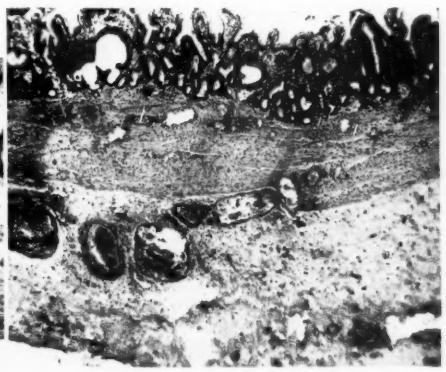

Fig. 19.

Fig. 19. Photomicrograph of the wall of the gall bladder of dog 21 in which the organ was removed from the living animal 67 days after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder. There is hyperplasia and hypertrophy of the mucosa with increase in the lymphoid material. All layers are thickened, there is an increase in the vascularity with perivascular infiltration, and a diffuse œdema with inflammatory cell infiltration. ×25.

gall bladder contained a slate colored material and the question still remained whether the color was produced by the black ink. In dogs 53 and 54 red ink was used and these showed 2 and 3 days after operation, areas of the gall-bladder mucosa which, to say the least, were very suggestive of reddish discoloration. Dog 56, in which black ink was used, was autopsied

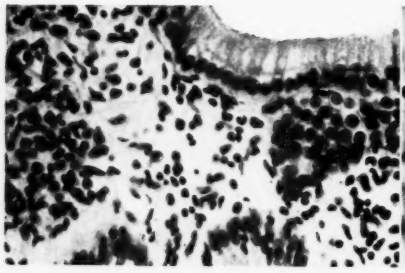

Fig. 20.

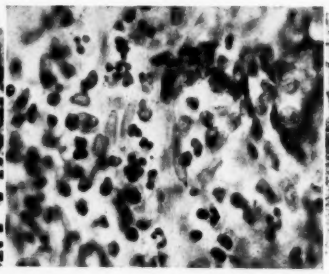

Fig. 21.

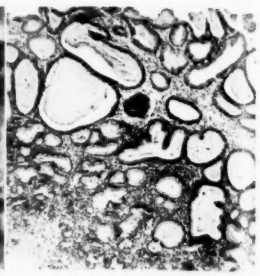

Fig. 22.

Fig. 20. Photomicrograph of mucosa in Figure 19, showing the invasion of all types of inflammatory cells. ×350.

Fig. 21. Photomicrograph shows the inflammatory cell infiltration into the mucosa of the gall bladder of dog 43 killed 175 days after a choledocho-pancreatic intubation in which the tubes were in position for 38 days. ×400.

Fig. 22. Photomicrograph shows the hypertrophy and hyperplasia with retention cyst formation and extensive inflammatory cell infiltration of the mucosa of the gall bladder of dog 35 which was killed 187 days after a choledocho-pancreatic intubation with the tubes in position for 9 days. ×26.

5 days after operation, and in this case the gall bladder was filled with a dense black material which was without question the black ink from the tube. The mucous membrane was stained a diffuse black (Fig. 3) and the duodenal contents were discolored as was the gall-bladder content. This experiment convinced me that fluids introduced into the terminal end of the common duct would find their way into the gall bladder and further I believed that in the preparation as described lay our means to determine the effect of pancreatic juice upon the untraumatized gall bladder.

In studying the details of this preparation, the question arose as to whether the stenosing effect of the T tube might bring about secondary changes in the biliary tract and gall bladder since Ivy and Walsh have shown that by constricting the common duct of the dog pathological changes will occur in the gall bladder. These changes are characterized by lymphoid and papillary hyperplasia of the mucosa but they do not as a rule take place for from 4 to 6 months. Ivy and Walsh have also produced stasis in the biliary tract due to reverse gut peristalsis by making a reversed duodenal loop. The pathological changes in these cases were practically the same as in the duct stenosis and occurred after a considerable period of time. In 3 animals we placed a T tube in the common duct, ligating the long arm of the tube and placing it in the peritoneal cavity. These animals were autopsied from 14 to 26 days after the operation. The microscopical changes in the wall of the gall bladder were insignificant but there was a distinct increase in the mucoid material in the contents.

The second type of preparation consisted in making a duodenal pouch into which the pancreatic juice drained. The proximal end was closed and the distal end cannulated. The continuity of the intestinal tract was reestablished by an end-to-end anastomosis between the upper segment of the duodenum containing the common duct opening and the proximal end of the jejunum. A T tube was then placed into the common duct and the abdomen closed. The long arm of the T tube and the duodenal tube were externally connected after the method of the previous experiment (Figs. 4, 5, and 6). With this preparation we felt assured that the pancreatic juice which was conveyed into the common duct would be activated juice. Three animals were subjected to this procedure. All of the animals died in less than 24 hours with extensive destructive changes throughout the entire abdomen.

A clinical study of all the animals subjected to these various procedures revealed the fact that they could be divided into three groups. In the first group the dogs died within the first 72 hours, the cause of death being acute peritonitis with bile stained bloody fluid in the peritoneal cavity. In some instances there was

evidence of a limited amount of fat necrosis. In the second group the animals appeared in good condition for several days after the operation, the first symptom being loss of appetite which was followed by rapid loss of weight, weakness, and diarrhœa, death occurring in from 3 to 8 days. Autopsies done after death uniformly showed early and extensive decomposition of the abdominal viscera. Those animals which were killed during their apparent terminal illness showed varying degrees and types of pathology. In some the belly was filled with bile stained bloody fluid with evidence of peritonitis while others showed fat necrosis with evidence of upper abdominal peritonitis only. A few showed practically no peritoneal pathology, but as a rule there were adhesions about the site of operative interference. The third group developed a moderate degree of indisposition after the operation but survived the condition.

THE GALL BLADDER

The pathological studies were devoted almost entirely to the gall bladder. In all cases in which cultures were taken from the contents of the gall bladder, they were positive, the predominating organisms being the staphylococcus and the colon group but in some instances unidentified organisms were found. Not infrequently there was a mixed infection. In every instance the gall bladder showed distinct pathological changes; a normal gall bladder was never found in a case in which the preparation or procedure was successful. One or both of two basic or essential types of changes were always present, either degenerative or regenerative. The degenerative change was characterized by necrosis. In the accepted animals, 17 showed complete necrosis of the gall-bladder wall while 8 showed incomplete necrosis with some evidence at times of reparative effort. In 19 animals the changes were classed as regenerative, this group including hypertrophic, hyperplastic, and inflammatory reactions.

Degenerative changes. Of the 17 animals in which complete necrosis of the gall bladder was found, 7 died in less than 24 hours after the operation. Three of these had a duodenal pouch with activated pancreatic juice conveyed into the common duct (dogs 57, 59, and 60), one, dog 23, had 15 cubic centimeters of pancreatic juice injected into the common duct, one, dog 17, had 15 cubic centimeters of pancreatic juice injected into the cystic duct and two, dogs 33 and 40 had a choledocho-pancreatic intubation. Two animals, dogs 28 and 34, died 2 days after a choledocho-pancreatic intubation, dog 28 dying of pneumonia. Dog 51 in which a choledocho-pancreatic intubation with black ink had been done was killed at the end of 2 days. Four animals died 3 days after operation. One animal, dog 15, had 15 cubic centimeters of pancreatic juice injected into the gall bladder and 3 animals, dogs 31, 37, and 44, had choledocho-pancreatic intubations, dog 37 being autopsied immediately after death. Dog 14 which had 20 cubic centimeters of pancreatic juice injected into the common duct died in 5 days and dog 29 on which a choledocho-pancreatic intubation had been done died in 9 days. Dog 36 on which a choledocho-pancreatic intubation had been done was killed at the end of 14 days, when it was in very poor physical condition.

The gross appearance of the partially or completely necrotic gall bladder was very misleading. In some instances there was no question but that the organ was gangrenous but frequently the only evidence was a thickening of the wall, the serosa and mucosa appearing fairly normal. The contents as a rule were either blood stained, dirty yellow, or thick and black with a heavy sediment. There was an excess of mucoid material and in one animal, dog 29, a clumpy material was found which looked like the precalculous material in the human gall bladder. The gall bladder of dog 23 was emphysematous and much thickened.

The microscopical examination of these specimens revealed two types of necrosis. In one the wall of the gall bladder was much thickened and no identification could be made of the various component structures in the wall. There was evidence of œdema and loss of all cell structure (Fig. 7). In the other type the various structures could be identified although no nuclei were present and as a rule the wall was but little thickened (Fig. 8).

Of the 8 animals in which incomplete necrosis of the gall bladder was present, one, dog 7,

died 14 hours after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder; one, dog 20, died 2 days after the injection of 15 cubic centimeters of pancreatic juice into the cystic duct; 2 animals, dogs 30 and 53, died 3 days after choledocho-pancreatic intubation; and another, dog 16, died 3 days after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder. Dog 56 died 6 days after a choledocho-pancreatic intubation with black ink in the observation bulb and was autopsied immediately after death. This specimen showed the black discoloration of the mucosa of the gall bladder (Fig. 3). Dog 48 died 7 days after a choledocho-pancreatic intubation and dog 9 was killed 19 days after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder.

The histological changes in the wall of the gall bladder in this group were very interesting since they form the connecting link between the state of complete necrosis and the state of regeneration. In some instances only an occasional nucleus could be seen as in dog 7 which died 14 days after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder. In other cases a few leucocytes could be seen with often a marked thickening of the serosa, the latter being due to œdema, inflammatory cell infiltration, and an increase in the number of young connective tissue cells. In several cases it was noted that the necrosing process seemed to extend from the mucosa outward, the serosa thickening as the process advanced (Fig. 9). This was pronounced in dog 30 which died 3 days after a choledocho-pancreatic intubation and in dog 56 which died 6 days after the same procedure (Fig. 10). As early as the third day the mucosa has shown signs of hyperplasia with necrosis (Fig. 11). It was noticed in one instance that the walls of the blood vessels were preserved and there appeared considerable perivascular infiltration, the remaining parts of the wall having undergone necrosis although a considerable number of inflammatory and young connective tissue cells could be seen throughout the outer parts of the wall (Fig. 12—dog 48, 7 days after a choledocho-pancreatic intubation).

Regenerative changes. Of the 19 animals in which the changes in the wall of the gall bladder were classed as regenerative, one, dog 8, was killed 1 day after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder; one, dog 54, was killed 3 days after a choledocho-pancreatic intubation with red ink in the observation bulb; one, dog 32, was killed 4 days after choledocho-pancreatic intubation, the animal being moribund; one, dog 64, was killed 4 days after a choledocho-pancreatic intubation; one, dog 66, was killed 5 days after a choledocho-pancreatic intubation; two animals came to autopsy on the sixth day after choledocho-pancreatic intubation; dog 27 died and dog 68 was killed. Dogs 41 and 50 died 7 days after choledocho-pancreatic intubation and dog 47 was killed 12 days after the same procedure. Dog 49 died 14 days after a choledocho-pancreatic intubation with black ink in the observation bulb and dog 61 was killed 21 days after an intubation. Dog 6 was killed 26 days after cholecystostomy, 20 cubic centimeters of pancreatic juice having been introduced into the gall bladder through the tube at the time of the operation and on the succeeding 5 days. The dog was in good condition at the time of the conclusion of the experiment. Dog 62 was killed 33 days after choledocho-pancreatic intubation. In dog 1 a T tube was placed in the common duct and 22 days later daily introductions of 20 cubic centimeters each of pancreatic juice were made into the common duct through the tube for a period of 6 days. The animal was killed 9 days after the last injection. Dog 18 was killed 57 days after the injection of 15 cubic centimeters of pancreatic juice into the gall bladder and dog 21 was killed 67 days after the injection of 20 cubic centimeters of pancreatic juice into the gall bladder. Dog 43 was killed 175 days and dog 35, 187 days after choledocho-pancreatic intubation.

The gross appearance of the gall bladder in this group varied considerably. Some were moderately distended but the largest percentage were contracted. The color with few exceptions was opaque grayish white and in many instances there was dilatation of the vessels of the serosa. The wall was thickened in practically every instance. The appearance of the mucosa also varied but the most con-

sistent finding was a definite grayish network on a pink base. This finding was interpreted as hypertrophy of the mucosal folds. At times plaques of light yellow or gray color appeared. These plaques seemed to lie just under the surface epithelium. Occasionally the mucosa appeared velvety or granular. The contents of the gall bladder ranged from black to light yellow bile as a rule with a sediment which was either a heavy chunky material or a fine black granular material which felt like fine sand. In the majority of cases there was an excess of mucoid material. Cultures were positive in all cases in which a bacteriological study was made, the colon group and the staphylococcus being the predominating organisms but a few organisms were found which were not identified. No anaerobic cultures were taken.

As early as 24 hours after the introduction of pancreatic juice into the gall bladder, distinct changes could be noted in all of the coats of the gall bladder as found in dog 8. The mucosa showed evidence of beginning lymphoid hyperplasia and inflammatory cells could be seen in the stroma. Leucocytes were found in the muscular layer and the serosa was much thickened, being œdematous and extensively infiltrated by leucocytes (Fig. 13). Very soon the mucosa became hyperplastic with occasional evidence of some local necrosis and usually by the fifth day the folds were more numerous and tortuous with distinct lymphoid hyperplasia. All types of inflammatory cells could be found in the stroma ranging from lymphocytes, plasma cells to eosinophiles and polymorphonuclear leucocytes (Figs. 14 and 15). The infiltration was not confined to the mucosa as the muscular and serous coats were also thickened by œdema and inflammatory cell infiltration (Fig. 16). In some instances the lymphoid hyperplasia of the mucosa was very extensive as seen in dog 62 which was killed 33 days after a choledocho-pancreatic intubation (Fig. 17). In this specimen the lymphoid changes were the most obvious but the stroma of the mucosa was extensively infiltrated by leucocytes as well. There were cases in which the changes were less pronounced as in dog 61 which was killed 21 days after a choledocho-pancreatic intubation. The mucosal hypertrophy and hyperplasia were less marked but there was extensive infiltration by plasma cells and eosinophiles. The blood vessels were enlarged and more numerous (Fig. 18).

The protocols of three animals may be of interest:

Dog 21. Twenty cubic centimeters of pancreatic juice was injected into the gall bladder through a needle and the gall bladder was removed on the sixty-seventh day. There were a few adhesions about the fundus of the gall bladder. The gall bladder was moderately distended, the vessels of the serosa were enlarged, and the gall bladder was an opaque, slate gray color. The contents were a reddish brown, thick liquid containing an excess of mucoid material with a grayish white flocculent material. The wall was at least three times the normal thickness. The mucosa was deep reddish brown and velvety with numerous small grayish white plaques. Microscopical examination showed the mucosa to be hypertrophic and hyperplastic with lymphoid hyperplasia and extensive inflammatory cell infiltration. The muscular and serous coats were thickened by œdema and extensive inflammatory cell infiltration. There was an increase in the number and size of the blood vessels (Figs. 19 and 20).

Dog 43. The animal was killed 175 days after a choledocho-pancreatic intubation, the tubes being in place for 38 days. There were a few adhesions between the duodenum, liver, gall bladder, and the abdominal wall. The gall bladder was bluish in color and the ducts were about twice the normal size. The wall of the gall bladder was but slightly thickened and the mucosa contained many small white patches about 1 millimeter in diameter. The contents were dark yellow with no deposit. The ducts were patent. Aerobic cultures showed few organisms, a short bacillus, and a large coccus. The microscopical examination showed numerous cysts in the mucosa and the stroma was extensively infiltrated by eosinophiles and other inflammatory cells (Fig. 21). The secreting epithelium seemed atrophic and granular, the cells taking the stain poorly. The muscular and serous coats were normal except for some inflammatory cell infiltration.

Dog 35. This animal was killed 187 days after a choledocho-pancreatic intubation, the tubes being in place for 9 days. The animal was not in good condition at the time of the conclusion of the experiment. There were a few adhesions between the liver, gall bladder, and the duodenum. The gall bladder was enlarged, the wall being gray in color. The ducts were dilated but there was no obstruction present. The contents of the gall bladder were dark yellow and contained a thick sediment. The mucosa was velvety. On microscopical examination the mucosa was found about three times the normal thickness showing hypertrophy and hyperplasia with many retention cysts (Fig. 22). The stroma was extensively infiltrated by all types of inflammatory cells, chiefly

eosinophiles. The changes in the muscular and serous coats were minimal.

DEDUCTIONS

It will be noted that the changes in the wall of the gall bladder have a degree of similarity whether the pancreatic juice was introduced directly into the gall bladder through a needle, injected into the cystic or common ducts with a needle, or continuously introduced into the common duct by means of a special preparation—choledocho-pancreatic intubation. It would seem that the sudden introduction of a relatively large amount of pancreatic juice—20 cubic centimeters is more likely to produce extensive changes than when smaller amounts were injected or when a choledocho-pancreatic intubation was used.

A study of the microscopical changes in the various gall bladders would lead one to believe that under some conditions the pancreatic juice brought about a prompt destructive action of the wall of the gall bladder as represented by a non-inflammatory necrosis with œdema. The question has been raised as to whether the destruction of the gall-bladder wall was in every instance a true necrosis or whether it might have been a postmortem autolysis in those cases in which the animal died and was autopsied some hours later. The findings would indicate that in some instances the changes were partially if not entirely a postmortem affair but since similar changes were found in animals which were killed or in which an autopsy was done immediately after death, there can be no question but that the process in many cases was a true necrosis and was associated with the introduction of pancreatic juice. Moreover in autolysis there is no increase in the thickness of the wall of the gall bladder whereas in some of our specimens there was a marked thickening as seen in Figure 7. At other times only partial necrosis took place with ulceration of the mucosa with at times rather marked changes in the muscular layer and thickening of the serosa. The changes in the muscular and serous coats appeared to be a reactionary response of the tissues to the destructive agent. Inflammatory cells were called forth, œdema was present, and in every way the process looked like a typical inflammatory reaction. This reaction might have been caused by the invading bacteria which were present in all cases in which cultures were taken, but since it has been proved that in dogs in 70 per cent of cases the mucosa of the gall bladder contains bacteria, in 30 per cent the bile contains colon bacilli and staphylococci and as Dragstedt has recently shown the pancreas in 90 per cent yields positive cultures, there must be secondary factors which afford the organisms suitable conditions to produce pathological changes in the structures. We believe that one factor is the pancreatic juice which on entering the gall bladder so devitalized the wall that the organisms, especially the anaerobes, had the necessary environment for secondary invasion.

In some instances the process was typically a reactionary or inflammatory response as evidence of necrosis was either absent or present in a minor degree. We do not believe that stasis alone will account for these changes since they were found in cases in which stasis was not present, moreover the changes took place much earlier than they appear in stasis. In those animals in which a T tube was placed in the common duct and allowed to remain in place for from 14 to 21 days the changes found in the wall of the gall bladder were insignificant.

The late changes in those cases in which a choledocho-pancreatic intubation had been done and the animals allowed to live for 175 days or longer are more difficult to explain. The common duct in each instance was patent and allowed fluid material to flow freely. In one case, dog 43, there was a scanty bacterial growth on aerobic culture from the contents of the gall bladder. In dog 21 the pancreatic juice was injected into the gall bladder and there was no mechanical interference with the ducts. The pathological changes in the latter case were so like those in the other two that we feel that the etiological process must be the same and is associated with the pancreatic juice introduced.

Another problem to arise was whether pancreatic juice can attack normal tissues of the gastro-intestinal tract. From experimental work done on the cause of pancreatic necrosis,

it must be concluded that such a process can take place if the pancreatic juice is activated, unknown factors contributing. Calzavara believed that bile would activate the pancreatic juice and by injecting bile into the pancreas brought about necrosis. Nordmann after ligating the ampulla noted a distention of the pancreatic ducts which were filled with bile but no necrosis, but after the injection of cultures of dog's fæces into the gall bladder, a prompt necrosis ensued. Dragstedt has recently shown that the decapsulated pancreas can be implanted into a window of the duodenum and no necrosis of the pancreas takes place but when the pancreas is implanted into a window of the gall bladder the animal promptly develops pancreatic necrosis. He has also shown that 100 cubic centimeters of pancreatic juice which have been passed through a Berkefelt filter can be introduced into the peritoneal cavity of a dog and cause no disturbance or fat necrosis but if the juice is not passed through a Berkefelt filter it requires 50 cubic centimeters or less to produce death. From these observations it would seem logical to conclude that bile and bacterial contamination have an activating effect upon the pancreatic juice. Since the gall bladder is an offshoot from the intestinal tract, embryologically, it is possible that there may be present, in some instances, glands which secrete enterokinase which may activate any pancreatic juice which finds its way into the gall bladder and thus explain the phenomenon.

A second factor, the alkalinity of the pancreatic juice, must also be considered. Ivy in attempting to study the absorptive power of the gall bladder, introduced 15 cubic centimeters of one-tenth normal sodium bicarbonate solution into the gall bladder. Within 24 hours he noted a violent reaction in the mucosa. Pancreatic juice has an alkalinity of about one-tenth normal sodium bicarbonate while normal gall-bladder bile is slightly acid and liver bile has an alkalinity approximately that of the pancreatic juice. It is therefore possible that the introduction of an alkaline substance into the gall bladder may have been responsible for some of the changes noted in our experiments; however it is difficult to explain why any unusual reaction should be manifested in a choledocho-pancreatic preparation because the pancreatic juice is mixed with common duct bile which has an equal alkalinity under ordinary circumstances.

After a critical survey of all the evidence submitted, it is reasonable to postulate that the process can be accounted for on the basis of complete or incomplete activation of small or large amounts of pancreatic juice in greater or lesser dilutions of bile in contact for short or long periods of time, any anatomical or physiological variations modifying the process, sufficient time and concentration being necessary for necrosis. Deviations no doubt accounted for the varying degrees of pathological changes found in our experiments. In the late chronic condition the mechanism can be explained on the basis that the pancreatic juice partially devitalized the structures of the wall of the gall bladder and secondary bacterial invasion took place. This acute cholecystic condition interfered with the functions of the gall bladder, especially the motility due to organic changes in the muscular and nervous structures leading to stasis which then formed the basis for the chronic cholecystitis.

In reviewing the results and interpretations of these experiments it is interesting to note the observations of Blad, Schoenbauer, and Westphal. Blad, in 1918, and Schoenbauer, in 1924, working on the dog and rooster demonstrated results similar to ours. Their experiments were constructed with the idea of determining the cause of non-perforative biliary peritonitis and for that reason introduced into the gall bladder duodenal juice to which was added cultures of streptococci and colon bacilli. The cystic duct was ligated at the time of the injection. The secondary elements introduced confused the problem so far as evaluating the result obtained from pancreatic juice coming in contact with the gall bladder. The experiments of Westphal are extremely interesting since he introduced human duodenal juice which had been assayed as to trypsin and amylase content and passed through a Berkefelt filter thus insuring the absence of bacteria. In the dog the introduction was made by opening the duodenum and cannulating the common duct through the ampulla, the juice being introduced into the

gall bladder without trauma to the ducts or gall bladder. He observed in 2 dogs 4 to 5 minutes after the introduction of duodenal juice that the gall bladder showed evidence of distinct gross changes. In one of his dogs, which died 10 hours after the transduodenal injection of 8 cubic centimeters of duodenal juice, the gall bladder was completely necrotic. He also reported two roosters which died 4 and 5 minutes after the direct injection of duodenal juice into the gall bladder, in each case the gall bladder had undergone complete necrosis. Westphal's experiments covered 42 animals and in every way the results compare favorably with the ones we have reported. The fact that he used sterile duodenal juice does not obviate the fact that a secondary infection most likely took place as was present in our cases, since Andrews has shown that when the cystic duct is ligated in the dog there is a prompt invasion of the liver side of the gall bladder wall by anaerobes of the Welch bacillus type; nevertheless Westphal reports one case in which the removed pathological gall bladder was sterile by culture although he does not state whether anaerobic cultures were taken or not.

In the human, in a variable percentage of cases, anatomical conditions are such as to form a continuous pathway between the pancreatic and biliary apparatus. Mann and Giordano placed it at 3.5 per cent while Cameron and Noble put it at 65 per cent and Westphal at 84 per cent. Since the secretory pressure of the pancreas is greater than that of the liver, any obstruction at the sphincter of Oddi may allow the pancreatic juice to pass over into the common duct, in case a continuous pathway is present, and from there ascend to the gall bladder as shown in our experiments.

The rôle that spasm of the sphincter of Oddi or stasis plays in the process deserves consideration especially so since it is known that during the excessive vomiting of pregnancy, reverse duodenal peristalsis occurs and possibly a spasm of the sphincter. In a variable number of cases the sphincter spasm may permit the passage of pancreatic juice into the common duct by virtue of a continuous pathway between the biliary and pancreatic ducts, thus allowing pancreatic juice to enter the gall bladder. This theory may readily explain the common occurrence of gall-bladder disease in the pregnant woman. Bundschuh described a case in which a small stone was found impacted in the ampulla, the patient dying of a non-perforative biliary peritonitis. The gall bladder was œdematous and completely necrotic with no sign of inflammation, the gall-bladder contents and the peritoneal fluid containing pancreatic ferments. Similar cases are reported by Ruppaner, Ruso, and Clairmont and Haberer. Westphal attempts to explain the formation of gall stones on the theory that the pancreatic juice enters the gall bladder producing destruction of part or all of the wall of the gall bladder. In case only portions of the epithelium become necrotic there is a change in the colloidal chemistry in the gall bladder and the dead epithelium then forms the nuclei for stone formation.

It is a fact that all cases of gall-bladder disease cannot be accounted for on the basis of a reflux of pancreatic juice, yet it does seem reasonable to believe that in some instances such an etiological factor must be taken into consideration.

SUMMARY

1. In the dog, when pancreatic juice is conveyed into the terminal end of the common duct, it can find its way into the gall bladder.

2. In all cases in which pancreatic juice was introduced into the gall bladder of the dog, there followed unmistakable pathological changes in the wall of the gall bladder.

3. It has been shown that in the dog if pancreatic juice has been introduced into the common duct for a short period of time, there follows a typical pathological picture of chronic cholecystitis which is definitely present 186 days later.

4. By analogy it is reasoned that in the human due to a continuous pathway between the pancreatic and bile ducts in a variable percentage of cases it is possible for pancreatic juice to enter the gall bladder and produce pathological changes.

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THE INCIDENCE OF GALL STONES AND GALL-BLADDER DISEASE

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WITH the purpose of ascertaining the incidence of gall stones and diseases of the gall bladder in the average run of the population, the gall bladder and bile passages from 1,000 routine postmortem examinations, between January and July, 1927, were studied. The material was prepared in the following manner: the stomach, duodenum, and liver were excised as one specimen, and a longitudinal incision was made along the lesser curvature of the stomach and dorsal aspect of the duodenum. Through this exposure the papilla of Vater could be examined in an undisturbed state. The gall bladder itself was opened by a longitudinal incision and any abnormal contents were set aside for later consideration. The common and hepatic ducts were opened and measured; the cystic duct probed and opened. Two hundred specimens were selected for histological study. All findings, normal or abnormal, were recorded.

The study includes subjects between 11 and 94 years of age. The sex distribution is shown in Table I. It is to be noted that 77.9 per cent of the subjects are over 40 years of age and 87.1 per cent over 30 years. Females are slightly in excess of males.

GALL STONES

Investigation of the recent literature shows that few similar studies have been made on consecutive routine necropsies. In textbooks of surgery and pathology, percentages of cases of gall bladder diseases and stones have been noted. Naunyn found 1 case in 30. Hekotoen and Riesman found calculi in 25 per cent of all cadavers at autopsy after the sixteenth year. In 17,402 necropsies in 10 years Hesse found 378 cases, or 2.17 per cent, of gall stones. From 19 European and American pathological reports including 80,802 necropsies, he found 4,848, or about 6 per cent of gall-stone cases. Graham, Cole, Copher, and Moore in their textbook on the gall bladder noted that 20 to 25 per cent of all adults have gall stones and probably an equal number have cholecystitis without stones, which leads to the conclusion that 40 per cent of our adult population have disorders of the biliary system. Mentzer (16) in 633 consecutive necropsies at the Mayo Clinic, found that 21.67 per cent of the adults

TABLE I.—AGE AND SEX DISTRIBUTION OF CASES

Age in years	Males	Females	Total
11 to 20	20	18	38
21 to 30	36	55	91
31 to 40	49	43	92
41 to 50	67	53	120
51 to 60	77	67	144
61 to 70	110	147	257
71 to 80	72	130	202
81—	19	37	56
Total	450	550	1000

had gall stones, and Hansen found that stones were present in the gall bladders of 24.7 per cent of 392 adult cadavers.

An examination of Table II shows enough difference between some aspects of the figures obtained in our study and those reported in the literature to warrant a report of our findings. The total number of cases with stones of all kinds was 325 (32.5 per cent).

The stones were divided into groups according to a recent classification of Aschoff and Bacmeister:

1. Inflammatory or common gall-bladder stones.
2. Pure bilirubincalcium stones.
3. Pure cholesterol stones.
4. Combination stones.
   (a) Combination bilirubincalcium.
   (b) Combination cholesterol.
5. Calcium carbonate stones.

The *inflammatory or common gall-bladder stone* is essentially a cholesterol stone with some bile pigment. It has various colors, is practically always facetted, and almost never larger than 2.0 centimeters in diameter. There is no gross crystalline structure, but a laminated structure, comparable to the cross section of a tree trunk, is present. Very frequently the stones fracture, the exact cause of which is unknown, and new lamellæ can be laid down around the fragments. By studying the cross section of the stone under the microscope its life history can be determined, and some authors believe that each new lamina denotes an attack of inflammation of the gall bladder. It is not within the scope of this paper to explain the detail of the structure of inflammatory stones, and the inferences which can be drawn therefrom. Suffice it to say that some highly interesting pictures are presented in the cross section of this type of stone. In this study 23.7 per cent of all the cases had inflammatory stones; 73 per cent of all the stones found were inflammatory.

Pure bilirubincalcium stones alone are considered in the class of non-inflammatory or metabolic stones because they are almost never associated with cholecystitis. Their physical characteristics make them unmistakable. Varying in size from a grain of sand to a pea, they consist chiefly of bilirubincalcium and mucus. There are hard and soft varieties, depending upon the admixture of mucus, and they have the appearance of minute black burrs. Two and nine-tenths per cent of all the cases had bilirubincalcium stones. Thus 9 per cent of all the stones were made up chiefly of bilirubincalcium.

The *pure cholesterol stone* contains about 98 per cent cholesterol. It is usually water-colored but may be stained a faint yellow from the bile. It is often egg-shaped with a long and a short diameter and may be smaller on one end than the other. On longitudinal section the radial, crystalline structure is well demonstrated. This stone is considered metabolic in origin. Twenty-two such stones existed alone in our cases; and comprised 7 per cent of the stone cases.

The two metabolic stones described above can offer a mechanical obstruction of the gall bladder at its neck, give rise to a stasis inflammation with the formation of the so-called *combination stone*. The metabolic stone is the nucleus and is encased in one or more layers of inflammatory deposit, which may show the same number of layers as any associated inflammatory stones present. These associated inflammatory stones are counted with the other inflammatory stones but are deducted from total stone cases. They comprise 9 per cent of the total stone cases. Combination stones with bilirubincalcium as a nucleus numbered 15 or 4.6 per cent of the stone cases. Combination cholesterol stones numbered 50 or 15.4 per cent of the stone cases.

The *calcium carbonate stone* is a rare form seen only on a few occasions. It is usually pure white or stained yellow with bile, and has the form of a mulberry.

Graham et al noted that cholelithiasis is found more commonly in women than in men;

the ratio being two to five times more frequent in the former. Hesse, in his large series of cases, puts the ratio as one male to seven females. In our cases there were 207 women (37.8 per cent of the females) and 118 men (26.2 per cent of this group) which is only 10 per cent more women than men.

Graham also noted that the incidence of gall stones increases as age advances with the majority of the patients over 30 years of age and less than 1 per cent under 20 years of age. In our series there were no cases under 20 years of age, which was not remarkable as there are only 38 cases in this group. Mosher in a study of 1,655 necropsy records at the Johns Hopkins Hospital found that 8 per cent of the patients dying in the fourth decade had gall stones. In the fifth and sixth decades there were 13 per cent. The most frequent age in Hesse's series was from 60 to 70 years. In our series 25 per cent of males and females were affected in the fifth decade, with a rapid rise with each decade until 50 per cent of both males and females over 70 were affected.

GALL BLADDER

Graham suggests the word "cholecystopathy" as an all-inclusive term for diseases of the gall bladder in order to retain the word cholecystitis for the true inflammation and allow this new term to include all pathological-anatomical as well as functional disturbances. Cholecystopathy will be used in this sense here.

With regard to the incidence of cholecystopathy Mentzer (15) found in 612 routine postmortem examinations evidence of cholecystic disease in 66 per cent of the cases. Our percentage comes out slightly below this figure; namely, 59.6 per cent. Graham states that gall-bladder disease is two and one-half times as frequent in females as in males. In Blalock's series of 888 cases from the Johns Hopkins Hospital the ratio of females to males was two to one.

In our cases the males were affected in 265 instances or 58.4 per cent of the group and females in 331 cases or 60.2 per cent of the female group. It can be seen again that males and females were nearly equally affected in this series.

In the literature it is generally held that gall-bladder disease is most prevalent after the fourth decade, although recent studies show it to be more frequent than one would expect under this age. Table III shows no continuous increase in incidence with the advance of the decades, but the general trend is upward. Thus the lowest percentage of cases with cholecystopathy is 20 per cent in the males between 11 and 20 years of age. The highest percentage is 77.6 in males between 71 and 80 years. After the fourth decade never less than half the individuals are free from macroscopic signs of a pathological gall bladder and under this age the percentages do not run very far below this figure. The microscopic sections were made in this series to confirm suspicious gross findings and every case was not sectioned; otherwise there would undoubtedly have been a higher percentage thrown over into the pathological groups. In the absence of stones, if the serosa was glistening, the gall-bladder wall not thickened, no evidence of scar formation in the mucosa, the gall bladder was considered normal.

In 848 cases of cholecystopathy in the Barnes Hospital, Graham found 7.6 per cent to be acute cholecystitis. *Acute cholecystitis* occurred in 48 cases or 8.3 per cent of our 596 pathological cases and was severe enough to be classified as *empyema* in 38 cases and *phlegmon* in 14 instances. In all of the cases in which the inflammation was severe, stones were present, and in some instances the stones had caused actual *ulceration* of the wall of the gall bladder (23 cases). However, even with the most extensive involvement of the gall bladder the process can heal, and in some cases is aided in the healing process by the establishment of drainage through a fistula (22 cases). There were 63 instances in which the inflammation had progressed so far that the gall bladder was entirely destroyed by the process and in the event of healing left a contracted mass of scar tissue.

Signs of *chronic and healed cholecystitis* were found in 300 cases, which is 30 per cent of the total cases and 50.2 per cent of the pathological ones. In some instances the gall bladder was the victim of such a marked sclerosing process that it presented itself as a shrunken

mass closely adherent to the stones. It is interesting to note at this point that many times when this occurred the stones would take up their position at the neck and in the fundus and give the appearance of an hour-glass (17 cases). Another sequel to healed inflammation is the formation of *diverticula* in the wall of the gall bladder (55 cases) in 31 of which the diverticula were very small and contained black concretions.

Most of the cases with *fistula* were in the healed class, for it was by the establishment of drainage in this manner that the infected gall bladder was healed. There was one exception to this, namely: when the gall bladder had established a communication with the stomach. Then extensive stone formation and inflammation supervened and all the patients died of their gall-bladder disease. This appears to be an argument against cholecystogastrostomy. In this series only the transverse colon, duodenum, and stomach had fistulous communication with the gall bladder.

Acute pericholecystitis was found in 30 instances with a walled off abscess in 14 of these cases. Only a minority of the cases (18 out of 48) with acute cholecystitis showed gross evidence of the inflammation having reached the serosa and in 12 instances the acute pericholecystitis was limited to the external layer. Under the latter circumstances, however, other intra-abdominal, suppurative lesions could be found. The construction of the wall of the gall bladder seems to be such that inflammation does not work its way through readily. This is also borne out by the fact that in a large group of chronic and healed pericholecystitides with or without pericholecystitic adhesions, microscopic as well as macroscopic evidence of inflammation in the mucosa and adjacent layers was lacking. Two cases in which large acid-fast tubercles were found in the subserosa showed no involvement of the other layers of the gall bladder.

Chronic and healed pericholecystitis was by far the most common pathological finding in this study. Chiray, Pavel, and Georges found 489 cases of pericholecystic adhesions in 1,000 selected cases with gall-bladder disease. Their cases occurred twice as frequently without stones as with stones. Of the cases with cholecystopathy 474 individuals or 82.2 per cent comprised this group; and in a large number of cases the condition existed alone. Only bladders with definite scar formation in the serosa were considered in this group and cases with a thickened indurated wall were classified under chronic cholecystitis. When the serosa remained glistening and smooth any strands were considered to be of an anatomical nature.

In 237 cases (39 per cent of all the pathological cases) scars and other signs of inflammation were found in the gall bladder in which there were no stones present. Most of these cases, however, came from those grouped under chronic pericholecystitis. In other cases with fistula no stones were found and had undoubtedly been emptied into the intestinal tract through the artificial opening. Thus it is seen that even the 32.5 per cent of gall-stone cases, as mentioned under the previous heading, is a low figure. On the contrary, however, 66 cases showed the inflammatory or common gall stone without signs of inflammation in the vesicle. Only 21 instances with signs of recent or old inflammation of the gall bladder were found when the metabolic or pure cholesterol and bilirubincalcium stones were present.

Next will be considered a condition which many authors feel is a pathological state of the gall bladder, namely, *cholesterosis*. Since this is not a definitely proved pathological condition it is given separate treatment (Table IV). It is not an inflammatory process but may be associated with inflammation. The mucosa contains an abundance of lipoid material which is easily seen as yellow granules against the red or green background of the mucosa. The condition is poorly understood at the present time, but Graham states that it may cause symptoms analogous to chronic cholecystitis, is relieved by operation, and should therefore be considered as an example of cholecystopathy. Lucène and Moulonguet found strawberry gall bladder in 15 cases out of 84, and referred to MacCarty who found 18 out of every 100 of 5,000 cases operated upon for cholecystopathy. Cholesterosis appeared in 368 of our cases, was more prevalent in the earlier than in the later decades, and was associated with other conditions in 203 cases. The majority of the associated pathological states

TABLE II.—TOTAL GALL STONES WITH AGE AND SEX DISTRIBUTION

	No. of cases	% of stone cases	M	F	11–20		21–30		31–40		41–50		51–60		61–70		71–80		81–	
					M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Inflammatory or common gall-bladder stone	237	73			0	0	0	7	1	5	8	12	9	16	27	45	30	53	8	16
Pure bilirubincalcium stone	29	9			0	0	0	0	1	0	3	1	1	1	6	8	3	3	1	1
Pure cholesterol stone	22	7			0	0	0	1	0	0	1	1	0	3	1	5	3	5	1	1
Combination bilirubincalcium stone	15	4.6			0	0	0	0	0	0	3	0	1	0	4	2	2	2	1	0
Combination cholesterol stone	50	15.4			0	0	0	1	1	0	1	2	1	9	2	14	4	12	1	2
Number stone cases	325		118	207	—	—	—	8	3	5	16	13	11	25	39	70	39	66	10	20
Percentage of stone cases	—		36.3	63.7	—	—	—	2.7	0.9	1.5	5	4	3.3	7.7	12	22	12	20	3	6
Percentage of total cases	32.5		26.2	37.8	—	—	—	14.5	6.1	12	24	25	14	37	35	48	54	51	53	54
Location of stones in biliary passages	No.	%																		
Stones in cystic duct	38	48.7			0	0	0	1	0	0	2	2	2	2	6	6	3	8	1	5
Stones in hepatic ducts	22	28.2			0	0	0	0	0	0	0	0	1	2	3	1	3	9	3	0
Stones in common bile duct	24	30.7			0	0	0	0	0	0	0	0	1	3	3	0	3	10	2	2
Stones at the papilla Vateri	47	60.2			0	0	0	1	0	1	2	2	0	4	9	6	6	12	2	2
Number cases with stones in ducts	78		30	48	—	—	—	1	0	1	4	4	2	5	11	11	9	19	4	7
Percentage of stone cases with stones in ducts	24		25.4	23.1	—	—	—	12	0	20	25	31	18	20	28	15.7	23	28	40	35
Percentage of total cases with stones in ducts	7.8		6.6	8.7	—	—	—	1.8	0	2.3	5.9	7.5	2.6	7.5	10	7.5	12.5	14.6	21	18.9

was chronic pericholecystitis and papillomatosis, while in a few instances a mild chronic cholecystitis was present. Common or inflammatory gall stones were present in 17 instances and pure metabolic stones in 13 instances of these cases without other demonstrable pathology. In 165 cases the condition existed alone and, if it is to be considered pathological, these cases are to be added to our total of 596 instances of known cholecystopathy. This makes a grand total of 761 cases of cholecystopathy or 76.1 per cent of unselected individuals.

Tumors of the gall bladder are divided into benign and malignant. Of the benign tumors only *papilloma* was found in this series and that in 78 instances. Hypertrophy of the mucosa was not considered under this heading. The growths had to be well developed with a body and pedicle to be classified as such. The papillomata usually contained lipoid material.

Deaver and Bortz found carcinoma of the gall bladder in 13 instances (1.4 per cent) of a selected series of 903 cases with gall-bladder disease. In 2,943 autopsies Lotzin found 27 instances of primary carcinoma of the biliary passages or practically 1 per cent. *Primary carcinoma* of the gall bladder and ducts occurred in 26 instances (2.6 per cent of the total cases) and in 2 of these cases the primary tumor was located in the bile ducts. Carcinomatous metastases from other sources, though frequent, had no apparent pathological effect on the gall bladder. When the gall bladder was the primary site there were practically always metastases in the ducts (19 of the 26 cases), especially the cystic and common bile ducts (Table V). This was a more frequent site for metastasis than the liver itself. Gall-bladder carcinoma rarely metastasizes to sites other than those mentioned. Four of the cases with the primary lesion in the vesicle showed no gall stones, but in two of these, however, fistulous communication with the duodenum and transverse colon made it appear that the stones had departed by this route. In the third case without stones the diagnosis was first made under the microscope, as the gall bladder had a normal gross appearance except at the site of the tumor in the fundus, where the gall-bladder wall was

TABLE III.—TOTAL CHOLECYSTOPATHY WITH AGE AND SEX DISTRIBUTION

	No. of cases	% of cases with cholecystopathy	M	F	11–20		21–30		31–40		41–50		51–60		61–70		71–80		81–	
					M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Acute cholecystitis	48	8.3			0	0	0	0	1	0	3	2	2	6	3	5	9	12	1	1
Empyema	38	6.3			0	0	0	2	0	0	2	1	1	5	5	5	4	9	0	4
Phlegmon	14	2.3			0	0	0	0	0	0	1	1	0	0	2	3	2	4	0	1
Ulceration	23	3.8			0	0	0	0	0	0	3	1	1	3	3	3	5	3	0	1
Chronic cholecystitis	300	50.2			0	0	0	7	3	5	14	13	16	23	36	55	37	59	10	22
Diverticulum	55	9.2			0	1	0	0	0	0	1	1	1	2	6	5	2	4	0	1
Fistula	22	3.7			0	0	0	0	0	1	1	2	0	0	6	3	2	4	2	1
Hour-glass gall bladder	17	2.8			0	0	0	0	0	1	2	1	0	0	3	3	0	5	1	1
Complete destruction of gall bladder by inflammation	63	10.5			0	0	0	2	0	0	3	1	4	5	8	13	6	16	2	3
Acute pericholecystitis	30	5.1			0	0	0	1	4	0	2	0	1	2	2	5	7	4	0	2
Pericholecystitic abscess	14	2.3			0	0	0	0	0	1	0	0	0	1	2	3	4	3	0	0
Chronic pericholecystitis	474	82.2			4	4	16	13	17	12	33	21	30	35	58	79	47	73	8	24
Signs of inflammation of the gall bladder without stone formation	237	39.0			3	5	15	8	14	8	22	12	23	17	30	32	15	27	0	9
Signs of inflammation of the gall bladder with metabolic stones	21	3.5			0	0	0	0	0	0	1	1	0	1	2	7	6	2	0	1
Inflammatory or common gall stones without signs of inflammation (restitutio ad integram)	66	11.0			0	0	0	3	2	1	1	2	3	4	10	15	7	11	2	5
Papilloma of gall bladder	78	13.0			0	0	7	5	4	4	6	3	7	3	7	11	7	8	3	3
Carcinoma of the gall bladder	26	4.3			0	0	0	0	0	0	0	1	0	4	2	1	3	9	2	4
Total cases	596		265	331	4	7	20	21	19	16	40	27	44	42	72	100	56	91	10	27
Percentage of cases with cholecystopathy	—		44.4	55.6	0.7	1.2	3.3	3.5	3.2	2.7	6.7	4.5	7.4	7.0	12.1	16.8	9.4	15.3	1.7	4.5
Percentage of total cases	59.6		58.4	60.2	20	38.8	55.5	38.1	38.7	37.2	59.7	50.9	57.1	62.7	65.4	68.0	77.6	70.0	52.6	72.9

folded on itself and slightly thickened. Lotzin believes that carcinoma of the gall bladder and stone formation are independent of each other and two of our cases present confirmatory evidence to this view. The first case without stones is of such interest that it merits a detailed report.

A housewife 77 years of age died on March 7, 1927, with a diagnosis of carcinoma of the gall bladder, metastases to the liver, and cholelithiasis. The necropsy failed to reveal the stones but the gall bladder was transformed into a carcinomatous mass, which had become adherent to the transverse colon with the establishment of a fistula. (The stones may have been emptied through the colon.) The cystic and hepatic ducts were completely occluded by metastases so that there was no bile in the gall bladder. Above the metastases in the hepatic ducts the latter were enormously dilated and contained water colored bile. Metastases were present in the liver. Since the patient's twelfth year she had had continuous stomach trouble and even before her tenth year attacks of true biliary colic had occurred. Since August, 1926, the patient had had three intermittent attacks of jaundice.

Before leaving the gall bladder, mention is made of the occurrence of *peritoneal bands* (Table IV). They were present in 73 instances and are not to be confused with adhesions formed following inflammation in the gall-bladder region. The latter condition is practically always associated with localized thickening of the liver capsule, while in the former the peritoneum retains its glistening appearance.

BILIARY DUCTS

Disease of the biliary ducts very rarely exists in the absence of cholecystopathy. Gall stones, tumors, and pathological conditions at the hilum of the liver are the chief causative

TABLE IV.—CHOLESTEROSIS OR STRAWBERRY GALL BLADDER. PERITONEAL BAND OF GALL BLADDER

	No. of cases	% of cases	M	F	11–20		21–30		31–40		41–50		51–60		61–70		71–80		81–	
					M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Cholesterosis with cholecystopathy	203	55.1			1	2	6	7	9	8	14	12	16	14	26	34	19	29	1	5
Cholesterosis without cholecystopathy	165	44.9			5	9	6	16	6	19	8	9	15	12	18	15	7	14	4	2
Total cases with cholesterosis	368		161	207	6	11	12	23	15	27	22	21	31	26	44	49	26	43	5	7
Percentage of total cases	36.8		35.8	37.7	30.0	61.1	33.3	41.8	30.6	62.8	32.8	39.6	40.2	38.8	40.0	33.3	36.1	33.1	26.3	18.9
Peritoneal bands of gall bladder	73				1	1	3	7	2	3	4	6	10	5	7	13	2	5	1	3

factors in disturbances of the biliary ducts. The last item consists mainly of tuberculous glands, carcinomatous metastases, and nonspecific inflammation at the hilum of the liver. Only in a minority of these instances was the function of the ducts impaired by external pressure and rarely was there a complete blocking of the ducts; but in most cases pathological conditions at the hilum of the liver left the biliary passages unaffected.

The importance of *gall stones in the biliary ducts* has been repeatedly emphasized in the literature. Wilkie found 47 cases of stones in the bile ducts in 257 operated cases of cholelithiasis (18 per cent). Clute noted an increase from 8.4 per cent to 17.9 per cent of common duct stone findings in a large series of cases operated upon for cholecystopathy in which there was a corresponding increase in explorations of the common duct. These are two representative illustrations from the literature of a selected series. Courvoisier has shown the frequency of stones in the bile ducts in figures given from postmortem records of the Basle Pathological Institute. In his series 3.9 per cent of all cases of gall stones and 0.4 per cent of 2,520 necropsies had stones in the bile ducts.

In this study 78 of the 325 cases with gall stones had stones located in the biliary passages (Table II). This is 24 per cent of the stone cases and 7.8 per cent of the total cases. One could conclude from this that every patient operated upon for cholelithiasis has one chance in four of having additional stones in the bile ducts. In this series there were 5 instances of gall stones in the ducts after a stone-filled gall bladder had been removed and in one of these the common duct was half filled with stones even after an exploration of this structure at the time of operation. The liver is the source of some of these stones.

It is to be noted that the percentages show no upward or downward trend with the advance of the decades, so that the age of an individual with cholelithiasis does not affect his 24 per cent chance of having stones in the bile ducts. A male with cholelithiasis has as much chance of having a stone in the duct as a female. The cystic duct and the papilla of Vater seem to be the most frequent extravesicular locations of stones; the former harboring 48.7 per cent of these stones and the papilla 60.2 per cent.

The sequelæ of stones in the ducts are *dilatation* of the latter and *laceration of the papilla of Vater*. There were 210 cases with definite dilatation of the biliary ducts in which 120 had stones in the gall bladder and 35 showed stones in both locations (Table V). Nine of the stones were of the metabolic variety. The remainder of the 210 cases showed cholecystopathy but no stones. Some authors feel that definitely dilated ducts, a lacerated papilla of Vater, and a gall bladder with signs of healed inflammation are evidence of preexistent stones, and there is no reason to believe that this is not the case. Under these circumstances many more than 32.5 per cent of individuals would have gall stones at some time in their lives. However, dilatation of the ducts and laceration of the papilla of Vater occur in the absence of cholecystopathy and in the case of the former (Luetkens) appears to be associated with general senile loss of tissue elasticity (55 cases). In 60 instances the

TABLE V.—DISEASES OF BILIARY DUCTS—AGE AND SEX DISTRIBUTION

		No. of cases	% of cases with disease	M	F	11–20		21–30		31–40		41–50		51–60		61–70		71–80		81–	
						M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Carcinoma	Primary	2	0.4			0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	Metastatic	19	4.8			0	0	0	0	0	0	0	1	0	4	1	2	1	7	0	3
Papilloma		5	1.2			0	0	0	0	0	0	0	0	0	0	1	1	2	1	0	0
Inflammation of bile ducts		60	14.5			0	0	0	2	1	1	3	3	1	5	9	10	6	15	2	2
Dilated bile ducts	Without cholecystopathy	55	13.3			0	0	0	1	0	0	3	4	3	3	6	14	4	10	3	4
	Total with cholecystopathy	210	50.8			0	0	0	1	0	2	9	2	5	19	24	43	27	52	6	20
	With stones in gall bladder	120	29.3			0	0	0	1	0	2	3	1	4	11	10	29	15	26	4	14
	With stones in ducts	35	8.4			0	0	0	0	0	0	0	1	0	2	5	6	4	13	1	3
Lacerated papilla of Vater	Without cholecystopathy	48	11.6			1	0	2	4	7	2	2	2	4	1	9	7	1	3	2	1
	Total with cholecystopathy	197	47.7			1	0	3	2	5	3	13	4	6	18	23	37	22	41	5	13
	With stones in gall bladder	101	24.4			0	0	0	1	0	2	6	2	2	9	12	28	10	17	3	9
	With stones in ducts	33	8.0			0	0	0	0	0	0	1	0	0	2	6	3	6	11	1	3
Stones in ducts without dilatation of the ducts or laceration of papilla of Vater		8	1.9			0	0	0	1	0	0	2	2	0	0	0	2	0	1	0	0
Operations for cholelithiasis with stones left in ducts		5	1.2			0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0
Fistula		5	1.2			0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	2
Diverticulum		4	0.9			0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0
Total		413		157	256	2	0	5	9	12	6	23	15	16	33	46	82	42	85	11	26
Percentage of cases with disease				38	62	0.5	—	1.2	2.1	2.9	1.4	5.5	3.6	3.8	8.0	11.1	19.8	10.1	20.6	2.6	6.3
Percentage of total cases		41.3		34.9	46.5	10	—	13.0	16.1	24.5	14.0	34.3	28.2	20.8	49.2	41.8	55.8	58.3	65.4	57.9	70.3

presence of stones in the ducts caused an actual inflammation of these structures, although in 8 cases the presence of stones left the ducts entirely unaffected. *Diverticula* and *fistulæ* occurred in a small number of instances and were associated with stones.

Of the benign tumors of the bile ducts only the *papilloma* was found and this in 5 instances. *Primary carcinoma*, which is not an infrequent finding in the literature (Fulde), was present in 2 cases. In both cases the ducts were completely occluded at the site of the tumor. One was situated in the left hepatic duct and caused a complete atrophy of that region of the liver drained by the duct. The other primary lesion was located at the lower end of the common duct, had involved the wall of the duodenum, and perforated the latter at one point. Common gall stones were present in the gall bladder, which showed no other signs of inflammation; and the ducts proximal to the lesion were enormously dilated. There were 19 instances of *metastatic carcinoma* from a primary gall-bladder lesion and in only 3 of these cases was there interference with the function of the ducts. One caused complete, the other partial, obstruction, and in the third the metastasis had caused a perforation of the duct.

SUMMARY

In the study of the material from 1,000 routine necropsies at the City Hospital in Vienna the following facts were brought to light:

1. In the series there were 450 males and 550 females. Eighty-seven and one-tenth per

cent of the individuals were over 30 and 77.9 per cent over 40 years of age.

2. Gall stones were present in 32.5 per cent of the cases. These were present in 37.8 per cent of the females and 26.2 per cent of the males. Twenty-five per cent of the individuals were affected after the fourth decade and 50 per cent after the seventh. Inflammatory or common gall stones made up 73 per cent of the stone cases.

3. Cholecystopathy occurred in 59.6 per cent of all cases and affected males in 58.4 per cent and females in 60.2 per cent. With the advance of the decades the case incidence increased from 20 per cent in the first age group to 77.6 per cent in the eighth decade. Chronic pericholecystitis was the most frequent pathological condition (82.2 per cent) and chronic cholecystitis was next in frequency (50.2 per cent). Primary carcinoma of the biliary tract occurred in 26 instances—7 males, 19 females—in which stones were present in all but 4 cases. In 2 cases the growths were primary in the ducts.

4. Cholesterosis of the gall bladder was present in 36.8 per cent of all cases. Males were affected in 35.8 per cent and females in 37.7 per cent of the cases. This condition was very frequent in the early decades and maintained a more or less constant average throughout the age groups. If cholesterosis is to be considered a pathological condition, the general average of cases of cholecystopathy would be raised to 76.1 per cent.

5. Pathological conditions were present in the biliary tract in 41.3 per cent of all cases. Males were affected in 34.9 per cent; females in 46.5 per cent. There was an increase in incidence of disease with the advance of the decades. The most frequent finding was dilated ducts in 50.8 per cent and next frequent a lacerated papilla of Vater in 47.7 per cent of the abnormal findings.

6. Gall stones were found in the bile ducts in 78 cases, which is 24 per cent of the cases with cholelithiasis. Males were affected in 6.6 per cent and females in 8.7 per cent of the cases. This finding was not affected by the age of an individual so that any patient with gall stones has one chance in four of having stones in the bile ducts. The most common site was at the papilla of Vater (60.2 per cent) and next frequent site the cystic duct, 48.7 per cent.

7. The figures presented in this paper are definitely higher than those found in similar studies in the literature.

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CHRONIC INFLAMMATION OF THE SALIVARY GLANDS WITH OR WITHOUT CALCULI

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THE symptoms and clinical picture of chronic inflammation of the salivary glands is sometimes not recognized by either internist or surgeon, with the result that mistakes in diagnosis and treatment are often made. The disease does not necessarily have to be associated with the presence of a stone in the gland or duct, and the stone, if present, is not always demonstrable by the roentgenogram.

We are reporting here 110 cases of nonspecific inflammation of the salivary glands, in 70 of which salivary calculi were present also. We have excluded from this group all cases in which tuberculosis, syphilis, and actinomycosis were the etiological factors, also cases of acute and postoperative parotitis and cases in which there were malignant lesions about the mouth or face.

SYMPTOMS

Although the clinical grouping of chronic inflammatory conditions of the salivary glands usually includes the presence or absence of a stone, from a clinical standpoint this makes little difference. Patients with chronic inflammation of the salivary glands usually present themselves for examination first, because of exacerbation of acute infection in an old chronic inflammatory salivary gland, and, second, because of obstruction of the duct by a small stone blocking the drainage of saliva. The most common complaint is the repeated exacerbations of acute infections rather than the symptoms of obstruction from a stone.

In all cases of salivary calculi, one can express pus or mucopus from the duct, and it is the acute exacerbation of this infection which is the most common symptom for which the patients present themselves. Some patients have had tonsils or wisdom teeth removed in an attempt to get rid of the repeated submaxillary inflammatory condition. So called salivary colic due to the swelling of the salivary gland behind the stone, accompanied by sudden severe pain in the floor of the mouth, tongue, and side of the throat, occurring during meals or sometimes with the mere sight of food, is an occasional symptom, but not the most common in this group of cases. Most of the patients have had symptoms extending over months or years, the average being 4 to 5 years; 39 per cent gave a history of previous attacks. The severe attacks of pain usually described as being pathognomonic of submaxillary stone rarely occur. Only 62 per cent of our patients noticed any pain, and most of them described the pain as mild. After an acute infection, pus usually discharges into the mouth; this relieves the patient of the pain and swelling, and he may not have another attack for months or years. A chronic inflammatory condition of the submaxillary salivary gland, in the absence of calculi, is usually due to a chronic condition following an acute abscess of the salivary gland. This may entirely clear up or continue to drain as a chronic productive type of infection. Of the 40 patients with chronic inflammatory salivary glands without calculi in our group, 14 (35 per cent) gave a history of intermittent swelling, and 7 (17 per cent) stated that the swelling was brought on at mealtime. Although pus can be expressed from the duct, it usually is thin. Infection may recur in this group, although between these exacerbations the gland gives little trouble other than its enlargement.

INCIDENCE

In 70 of the 110 cases salivary calculi were present and in 40 no calculi were found. Calculi of the salivary glands or ducts are considered by most observers to be very uncom-

mon. Erdman, in 1920, found 300 cases in the literature, and Harrison, in 1926, raised the total number to 375 and added 27 cases of his own.

Calculi are found most often in the submaxillary gland or duct and less often in the sublingual gland. Wakeley reported the percentage of incidence according to the gland or duct involved as: submaxillary, 63.2 per cent; parotid, 20.6 per cent; and sublingual, 16.2 per cent. In our series of cases, there is a larger portion in the submaxillary gland; that is, the submaxillary gland or duct, 66 (92.9 per cent); the parotid gland or duct, 3 (4.3 per cent); and the sublingual gland or duct, 2 (2.8 per cent). Although Wakeley, after careful search of the literature, was able to find references to only 3 cases in which the calculi were present in more than one gland or duct in the same person, we noted in one case the presence of calculi in both the submaxillary and sublingual ducts, and in one case both submaxillary glands were involved. The right submaxillary gland is affected almost twice as often as the left. We are unable to account for this coincidence, and we did not find any reference to this observation in the literature.

The condition occurs in middle life. According to Wakeley, more men are affected than women (proportion 2:1). Carter put the proportion as about 5:1. In our 70 cases of chronic inflammation of the salivary gland with stone, 45 patients were males and 25 were females. In the 40 cases of chronic inflammation of the salivary glands without stone, the submaxillary gland was also the most commonly affected. On the other hand, the acute postoperative inflammations that are commonly seen after operations on the upper part of the abdomen are usually situated in the parotid gland rather than in the submaxillary. The distribution of our cases was: submaxillary gland, 32 (80 per cent); parotid gland, 5 (12.5 per cent); and the sublingual gland, 3 (7.5 per cent). In this group, as in the cases in which calculi are present, males are affected about twice as often as females. In our series of 40 cases without stone there were 27 males and 13 females; their ages were about middle life. There were only 3 cases of parotid calculi in our series; in 1 case they occurred in the gland itself, and in 2 cases in Stenson's duct. In these 3 cases there was a history of long duration, with intermittent swelling and slight pain. In each case a single calculus was found. Wakeley stated that multiple parotid calculi are more common than single. He also stated his belief that formation of the abscess is common around long standing calculi, and that in case an abscess opens externally a fistula generally results. There were 2 cases of sublingual calculi, and in 1 of these a stone was present in both submaxillary and sublingual glands (Figs. 1, 2, and 3).

Fig. 1. Retouched roentgenogram. The large stone in the submaxillary duct and the multiple stones in the submaxillary salivary gland may be seen.

ETIOLOGY

Wakeley, in a study of calculi in the submaxillary region, found that they were 75 per cent calcium carbonate and 10 per cent calcium phosphate. Saliva from the submaxillary salivary glands permits calcium salts to be seen more easily than does the saliva of the parotid or lingual gland, due to the high percentage of solids and organic matter, the greater degree of alkalinity, and the low content of carbon dioxide. Tartar usually forms about the lingual surface of the lower anterior teeth, and it is probably the same factor that produces the stones in the submaxillary glands

and ducts. Roberg, who investigated 47 cases of salivary calculi, stated that foreign bodies and salivary calculi often are present in the duct. Wakeley showed a fishbone found in a Stenson's duct with salivary calculi around it. Foreign bodies in the salivary ducts are rarely seen and probably are not factors in the production of salivary calculi. The stones may form around organic matter or bacteria in the gland substance of the duct.

PATHOLOGY

The size of salivary calculi varies from a few millimeters in diameter to 3 by 5 centimeters as reported by Garretson. Orth described a stone weighing 70 grams. Although t is rare to find more than one stone in a single gland or duct, Noehren reported a case with fourteen stones in Wharton's duct and Söderlund found thirty in the submaxillary duct. In 8 of our cases stones were multiple. In 4 cases there were two or three stones in the submaxillary gland. In 3 other cases there were multiple stones in the submaxillary duct.

The pathological changes in these cases have been considered by Henke and Lubarsch. The obstruction resulting from stone in the duct causes congestion of the mucosa of the ducts with petechial hæmorrhages. In case a large stone is present, erosion and ulcer may result. These processes lead to the formation of granulations with resulting fibrosis and more complete obstruction. As a result of the obstruction to secretion the intralobular ducts become congested and dilated; this is followed by atrophy of the tissue of the gland. After obstruction, infection results readily, often forming a phlegmon in the gland and surrounding structures.

Henke and Lubarsch mentioned that stones may be extruded by the formation of a fistula which communicates with the surface of the skin. This was found in 3 of our cases. Roberg was unable to find references to salivary fistulæ other than those connected with Stenson's duct. Harrison reported 1 case in which a salivary fistula was connected with Wharton's duct. Only 4 cases of external fistula were noted in our entire series, and all were associated with the submaxillary gland. A diagnosis of branchial sinus was made in 1 case, and thyroglossal sinus in 2 cases, because the opening of the sinus was close to the median line.

Henke and Lubarsch described two types of chronic inflammation of the salivary glands without stone, the chronic exudative and the chronic productive. Chronic exudative inflammation often follows acute inflammation and may be associated with it. The gross picture is that of swelling and enlargement of the gland, associated with abscess. Microscopically, there is lymphocytic and plasma cell infiltration associated with a lesser degree of leucocytic infiltration. The purulent material forms around granulation tissue resulting in the formation of abscess.

METHODS OF DIAGNOSIS

In the examination of a patient presenting an enlarged submaxillary gland, a bimanual examination should be made. In 92 per cent of our cases in which stones were present, pus could be expressed from Wharton's duct. The opening of the duct is usually red and thick and if a stone is present it can usually be felt with the forefinger. We do not believe that probing the duct is advisable, as this frequently tends to stir up secondary infection by traumatizing the duct and does not aid in the diagnosis. The roentgen-ray should always be used to confirm the clinical diagnosis, and in cases in which the stone is lodged in the gland itself with much thickening, it may be the only positive way of finding the stone. Erdman considered the roentgen-ray of little value, whereas Harrison found it of positive value in 75 to 85 per cent of his cases. In 80 per cent of our cases in which stones were present, they were demonstrated in the roentgenogram. Hickey described improved technique for demonstrating these calculi. The patient is allowed to lie supine on the table with the head projecting over the end. A large film is placed in the mouth and held in position by closing the teeth. The roentgen-rays are directed from above downward, with the central ray passing through the center of the mouth.

Differential diagnosis in this group must include chronic submaxillary lymphadenitis, actinomycosis, carcinoma of mixed tumor

Fig. 2. Retouched roentgenogram. The rounded stone in the submaxillary salivary gland may be seen.

Fig. 3. Retouched roentgenogram. The multiple stones in the submaxillary salivary gland, and one very large stone may be seen.

type, and specific inflammatory lesions such as syphilis and tuberculosis.

TREATMENT

The treatment depends on the condition at the time the patient comes for examination. If there is an acute infection, as there often is, the use of hot irrigations and hot dressings is the advisable treatment until the acute condition subsides. Probing the duct or any manipulation at this time not only is not beneficial, but frequently increases the cellulitis and is a very dangerous procedure. After the acute condition has subsided, roentgenograms are made to exclude the presence of a stone. If a stone is present and is situated anteriorly in the gland or in the duct, removal through the mouth is the treatment of choice. Removal of the stone, however, may not clear up the condition of the gland, because of the nature of the gland and the multiple pockets of inflammation that may be present.

In 30 of our series of 70 cases of chronic inflammation of the salivary gland with stone, the stone was removed from the duct. In 13, the stone was removed from the body of the gland through the mouth. In the remaining 27, on account of the situation of the stone and the amount of infection present, it was thought best to remove the entire gland. Of the 30 cases in which the stone was removed from the duct there were 4 (13 per cent) in which there was recurrence of symptoms. In the 13 cases in which the stone was removed from the body of the gland there were 3 (23 per cent) in which there was recurrence of symptoms. In the cases in which the entire gland was removed, there was no further trouble. So in 43 cases in which the stone was removed from the duct or the gland through the mouth, there were 7 (16.3 per cent) in which symptoms recurred. If, however, there is a great deal of infection present in the gland and a long history of recurring suppuration, it is useless to expect this to be entirely cleared by removal of the stone alone. It is this type of case in which removal of the entire gland is the advisable treatment.

In the group of 40 cases of chronic inflammation without stone, 18 patients had received treatment before examination at the clinic. Drainage from the outside was instituted in 13; drainage through the duct, the duct having been probed, in 3; and a stone had been removed from the duct in 1 case. In this latter group of cases, if the exacerbations are giving sufficient trouble, the only treatment advisable is removal of the entire gland

if the condition is present in the submaxillary region. The entire gland was removed in all but 2 of our cases, without recurrence in any. In a small group of cases in which the parotid gland has been involved, vaccine has been used, but the results have been rather indifferent. In some cases much benefit has resulted. Treatment by roentgen-rays has been advocated in cases in which the parotid gland was involved in order to destroy the substance of the gland.

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ROENTGENOGRAPHIC DIAGNOSIS OF DISEASES OF THE BREAST

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IT is not necessary to emphasize that any additional method of diagnosis which promises increased accuracy in any field is welcome. It is not always possible to diagnose lesions of the breast with the degree of accuracy necessary for definite therapeutic decision. Of course, the general dictum is—remove lumps in the breast or at least explore them. Frozen section diagnosis in the hands of competent pathologists has rendered noteworthy service in the decision of what to do in many cases. In the clinical diagnosis, however, there still remains a margin of error which it is advisable to reduce.

Before describing the various shadows cast by normal and pathological breasts, it is necessary to have a clear mental picture of both normal and pathological organs as determined by gross and microscopic studies. It is quite well established that a "normal" breast is a composite of certain fundamental anatomical structures in various stages of development and change due to such factors as age, adiposity, puberty, the menstrual cycle, pregnancy, menopause, pre-existing pathological lesions, etc. A brief résumé is as follows: In both male and female children before puberty, the breast, as a rudimentary organ, consists of a nipple from which a few ducts radiate fanwise. The ducts are embedded in dense connective tissue relatively poorly nucleated and poorly vascular. At the end of the ducts are blunt, blind extremities. Puberty determines the onset of sex differences which are fundamentally of degree only. The breast at puberty enlarges by hypertrophy and hyperplasia. When completed it consists of a number of lobes separated from each other by connective tissue and elastic septa coming from the anterior sheath of the pectoralis muscle. In these lobes is a supporting tissue of fat in varying amounts in a loosely constructed, poorly cellular, fibrous tissue with some elastica. The blind ends of the ducts in the prepuberal stage develop buds in increasing number and complexity which are canalized further and further into the organ. Whorled around the final ends of these duct complexes is another kind of connective tissue, the so called perilobular connective tissue. The changes of pregnancy begin as soon as conception occurs and consist of: (1) ever increasing budding and hyperplasia of the ends of the ducts, and (2) disappearance of the connective tissues. At the end of pregnancy, the normal breast is then a mass of ducts and acini with just sufficient connective tissue for support. Naturally, there is increased vascularization. When lactation is interrupted the reverse occurs; the epithelial structures disappear, and the connective tissues reappear until the end-result is an anatomical structure similar to that before conception occurred.

Exactly the same changes occur at each menstrual period but less in degree. Thus the breast of the woman from the ages of puberty to menopause is never quiet, but suffers reciprocal growth and disappearance of epithelial and connective tissues.

Various pathological lesions are caused by failure of proper involution of both the lactating breast and the breast regressing from the menstrual stimulus. The epithelial cells disappearing by way of cloudy swelling, fatty degeneration, autolysis, etc., are removed by the lymphatics but some desquamated cells may remain in both lymphatics and ducts and obstruct them. The perilobular connective tissue as it grows may also obstruct ducts and lymphatics. This leads to damming back of material and the formation of cysts as a local or more or less diffuse process. Secondary changes such as cellular infiltrations and proliferation of connective tissue may then occur. When these changes are present, as they are to some degree in nearly every breast, there is this constant stimulus to further rearrangements, and growths, and exudations even after the menopause.

The commonest benign tumor of the breast is the periductal fibroma. (This name is used

to include such tumors as are often called adenofibroma, fibro-adenoma, intracanalicular adenomyxofibroma, etc.) They are localized growths, encapsulated, denser than normal breast tissue, contain practically no fat, and show a tendency to lobulation usually into small complexes separated from each other by heavier bands of connective tissue.

Cysts of the breast other than those caused by abnormal involution or those grouped under the condition known as "Schimmelbusch's disease," are of inflammatory origin and contain pus, or are such structures as galactoceles.

The essential pathological features of carcinoma of importance in the interpretation of roentgenographic shadows are about as follows:

The majority are harder and denser than normal breast tissues, cysts, and benign tumors. They are not encapsulated and most of them have irregular outlines and polyhedral shapes. They spread in four well defined ways as regards influencing X-ray shadows: (1) by centrifugal growth, which both invades and compresses surrounding tissue; (2) by sending out longer and shorter prolongations from various parts, probably following the lines of least resistance; (3) by permeation through lymphatics; and (4) by spread through ducts. An important point for consideration is the fact attested by many pathologists that carcinoma cells may spread through the ducts over large areas of the breast from an original, even relatively small, tumor. This spread through the duct is, no doubt, now favored and now hindered by the growth, spread, and vascularization incident to the changes of the menstrual cycle. Another distinct type of carcinoma of the breast consists of the simultaneous or step-by-step change into carcinoma of various separated parts of the breast, i.e., there are multicentric origins. Another important type is the one in which practically the entire breast, almost explosively, turns at once into carcinoma. This produces the so-called *carcinoma en cuirasse.*

These physiological and pathological facts considered, it is therefore necessary to establish radiological standards for:

1. Breasts before puberty
2. Breasts before climaterium
3. Breasts during pregnancy
4. Breasts in the climaterium
5. Breasts after the climaterium

Study of the breast before puberty meets with a great deal of difficulty. These breasts are small, compact, and lie close to the thoracic wall; their tissues, particularly the glandular and fatty tissues, are not developed and therefore the radiographic shadows cast are light and indistinct. Due to this, it is almost impossible to get a good roentgenogram at this period of life whereby a definite study of the architecture can be made. Fortunately this is not the time of life when the roentgenographic study of the breasts is important.

As would be expected the radiographic appearance in a woman before the climaterium and after puberty shows a distinct variation in the appearance and architecture according to the time of the month, i.e., the stage of the menstrual cycle. In a roentgenogram is noted a triangular area with the apex at the nipple and the base along the pectoral fascia. This triangle is shadowed by well defined lines radiating to the pectoral fascia through a more or less homogeneous opacity. The shadow lines are the lactiferous ducts with their accompanying fibrous tissue. The anatomical changes in them and in the intervening homogeneous material give variations in the appearance of this roentgenological triangle as the individual approaches or recedes from the menstrual period. While the details vary, the triangle remains, occupying about three-quarters of the breast as seen in sagittal plane. It is in the disturbance of this triangular area that hints are given for the diagnosis of pathological conditions. (Fig. 1.)

The details for the normal changes are as follows:

In the first few days after the start of the menstrual flow, epithelial degeneration is occurring and relatively more space in the breast is occupied by the fatty and hyperplastic connective tissue. Radiographically well defined linear striations with intervening homogeneous shadows are then shown. These linear striations are of increased density because the connective tissue is hyperplastic

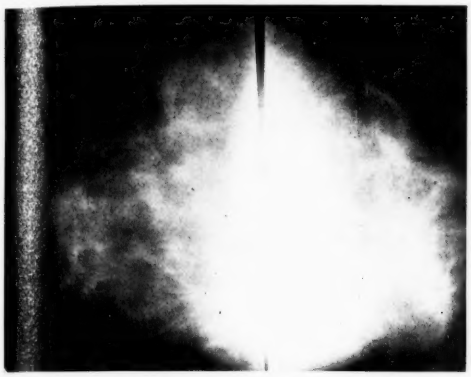

Fig. 1. Normal breast.

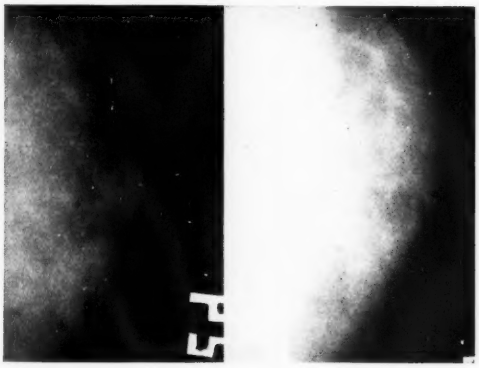

Fig. 2. Seven days before and seven days after menstruation.

their shadows are clear cut, well defined, and radiate from the main ducts, just posterior to the nipple, to the pectoral fascia. We have termed this the striated breast triangle. As the subject approaches the next menstrual period the striations become less distinct, and gradually, wave-like outlines are developed at right angles to the linear striations. These wavy striations are lace-like, fringed, usually curved, giving a surf-like appearance to the entire triangle. As this wavy structure gradually increases the triangle becomes more compact and reaches its maximum opacity about 10 days before the first day of the oncoming menstrual period. This is to be emphasized, viz., the breast reaches its maximum compactness about a week and a half before and not at the beginning of the menstrual flow. (See Fig. 2.) The increase of this surf-like appearance is the mirror of the general hyperplasia of epithelial cells as demonstrated anatomically. The greater the hyperplasia, the greater the wave-like appearance. Hence, the opacities at this time are shadows due to epithelial hyperplasia with coincident regression of connective tissue which therefore increases the density of the breast. At this time, namely, 10 days before the oncoming of the menstrual flow and continuing after the flow has started, the epithelium degenerates and the connective tissue coincidentally undergoes hyperplasia. Vice versa, the radiogram shows a decrease in the wave compactness of the breast, in density, and a loss of surf-like effect as the wavy striations are replaced by the well defined linear striations of connective tissue hyperplasia again surrounding the lactiferous ducts and their terminal lobules.

Mucoid secretion of the epithelial cells during the stage of epithelial hyperplasia also increases the density of the breast, thereby giving it a more compact appearance from the radiographic standpoint.

In normal breasts, the lymph nodes of both the pectoral and axillary groups cannot be visualized because their density is so nearly that of the surrounding tissue. Hence a normal lymph node will *not* throw a radiographic shadow sufficient for study.

During pregnancy, few, if any, changes in the radiological architecture that are sufficient for roentgen interpretation are noted before the sixth month following conception. At about the sixth month after conception has taken place, the same changes are noted in structure which have previously been described as occurring the week before the onset of the flow of menstruation, only on a much greater scale. At this time instead of a fine lacy appearance, there is a heavy, coarse, lacy, surf-like picture, most of which is due to an increase in the number of cells in each lobule with an increase in the number of lobules themselves. For, the histology of the breast during pregnancy and to term shows the process to be an hypertrophy and hyperplasia of the gland tissue, invading and displacing

Fig. 3. Fibroma (benign).

the fatty tissue with a coincident regression of the connective tissue. However, to a lesser extent there is in addition a general engorgement of the breast vascular tissue to provide the increased blood supply necessary for the increase in actual number of cells and their function. The lobule margins gradually fade into the surrounding fatty tissue which the hyperplastic glandular cells are replacing.

The radiographic appearance of the breast after the cessation of the normal menstrual life can be described as an architecture of shrinkage. The linear striations of the breast triangle, which represent the contracting connective tissue, as well as the lactiferous ducts, are crowded together, forming a heavier opaque triangular mass lying on the pectoral fascia. In general, this dense opaque triangle is the rule, but in those cases in which the individual is disposed to adiposity, the triangle may be less dense, due to the interposition of fatty tissue in the connective tissue. The linear striations in this period differ from those seen in carcinoma in the fact that they tend to be regular and to radiate from the nipple whereas those of carcinoma may radiate in any direction, and as will be stated, give a picture of general disruption of the structure of the breast triangle.

It is not unusual in these post-climacteric breasts to find small, oval, irregular shadows with definitely defined outlines simulating those seen in abnormal involution; these are small cysts that have been present in the breast before the menopause and have merely been carried over into this period.

One of the most frequent breast conditions which must be distinguished from malignancy is that of abnormal involution. The differential roentgen diagnosis is often difficult and sometimes impossible when early carcinoma of the breast is considered. The general radiographic picture in abnormal involution is that of a number of small, overlapping areas, differing in density and distributed in the regions occupied by the lactiferous ducts. These areas, at least in the advanced cases, are more or less oval and have regular capsule-like outlines, giving them well defined borders. This well defined border is one of the important diagnostic points distinguishing this condition from carcinoma, for the border in small areas of carcinoma has a fading lace-like character and is not nearly as well defined. The central portion of these cystic areas is radiographically less opaque, hence they have a lighter center and vary in shadow intensity toward the periphery, particularly so when compared with the homogeneous opacity of carcinoma. The distribution of the areas of abnormal involution is also somewhat at variance with those of malignancy; they always occupy the same distribution as the lactiferous ducts, whereas those of malignancy may be found in any location of the breast because their spread is often via the lymph channels. The filling in and increase in the compactness of the ducts is sufficient reason for giving the striated architecture of the breast, which represents these ducts, a more definite and well defined appearance than is noted in that of malignancy where interruption and displacement of the striated architecture is the rule.

Benign tumors of the breast give a distinctly different radiographic picture from that of abnormal involution and malignancy. Benign growths are usually localized and do not tend to spread; they have well defined borders as compared with the fading indistinct border of carcinoma. In carcinoma, the architecture is generally disrupted while in the benign growth the linear striation of the breast triangle appears merely crowded to the sides to make room for the growth; in other words, the growth with its encapsulated outlines is bordered by a general crowding together of the linear striations of the breast triangle.

Fig. 4. Concentric carcinoma.

The differential diagnosis between a solid benign tumor and a cyst can readily be made by making use of the differences in density between the two conditions. A cyst containing fluid is relatively less dense than that of a solid tumor, therefore a positive shadow as a result of the greater photographic effect upon the X-ray film. The opposite is noted in solid tumors. A galactocele may also be demonstrated in this manner. Except for the above differential points, cysts and solid tumors have many characteristics which are similar, such as a regularly defined outline produced by the capsule and, as stated, a crowding and displacement of the linear striations of the breast triangle as distinguished from their invasion in carcinoma. (See Fig. 3.)

A caked breast comes under the same category as that of the cysts, since it will also throw a positive shadow, but the shadows here are multiple and linear in type following the general direction of the lactiferous ducts and their accompanying fibrous tissue. This is a condition of the breast that can be very easily mistaken for that of abnormal involution when only the radiographic evidence is taken into consideration. An inquiry into the clinical history of the patient, however, will bring a correct diagnosis.

Malignant disease of the breast, more especially carcinoma, may be demonstrated by the roentgen ray, first of all, by a general disruption of the normal triangle of the breast. Usually, the main mass of the tumor lies some distance below the skin surface and instead of having a more or less linear striated architecture, as the normal breast, it has a concentric, whorling appearance with the greatest opacity at or about the central

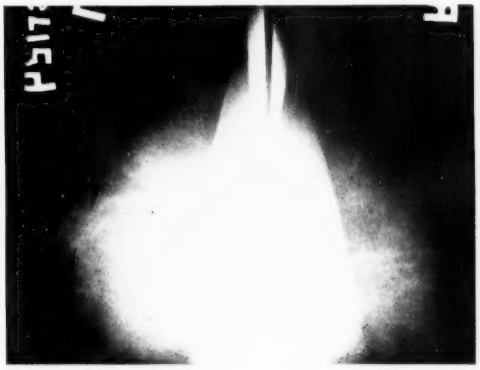

Fig. 5. Tumor bridge.

portion of the mass. The edges of the mass are fringed and tend toward striation but not necessarily in a triangular form with the apex at the nipple, as in normal breasts; rather the radiations have the central opacity of the mass as their center of radiation. (See Fig. 4.) There is, however, in the great majority of malignant breast tumors, a band-like radiation from the tumor mass to the nipple, but this is more dense and well defined than the usual triangular striations of the normal breast. This banded bridge is an extension from the main mass to the nipple by the way of the lactiferous ducts, for as stated, the lactiferous ducts are often entirely filled with malignant cells. This bridge is one of the points used in differentiating a malignant mass from an inflammatory area or a benign growth. (See Figs. 5 and 6.)

When the roentgenogram is compared with the actual specimen, it is found that the dense central opacity consists of the densest part of the malignant growth. As the radiographic shadow decreases in density toward the periphery, so the malignant cells decrease in number until finally only rows of cells are seen in the lymphatics or ducts, or spaces of the breast tissue. Here they represent an extension by continuity. It is this extension that gives the fringed radiating striations from the central mass. This fringed border of the central opacity is, then, the result of the extension by continuity of the main mass along the lymph channels, lactiferous ducts and spaces. In the early specimen it has a

Fig. 6. Tumor bridge.

Fig. 7. Malignant growth simulating a capsule.

spreading appearance, while in the later ones its finger-like processes, instead of being blunt and rounded, are well defined, and usually pointed with spicule-like projections into the surrounding tissues, due to the secondary contraction or general pulling in of the mass itself. The important point in differentiating the radiographic striations lies in the fact that they radiate in all directions instead of fan-like, with the base at the pectoral border and apex at the nipple. However, there may also be a more or less band-like increased opacity which reaches from the main mass to the nipple which consists of malignant as well as connective tissue overgrowth. It is this extension along the lactiferous ducts and their accompanying fibrous tissue network that finally contracts and draws the nipple in, giving us what is termed the inverted nipple.

In a great many malignant tumors when the main mass has become large, the periphery loses some of its lace-like extensions and takes on a more regular appearance simulating a capsule. (See Fig. 7.) This is due to the compression of the outlying malignant cells against the intervening normal breast tissue. In most cases this will not hinder the diagnosis for the other characteristic features of the growth are quite definite. It is this compression, caused by the growth of the malignant cells and their crowding one another that gives the whorling appearance which is so typical in these tumors; in the later stages however, the compression may be so great that the whorl-like architecture is entirely

Fig. 8. Radiating carcinoma with abnormal involution.

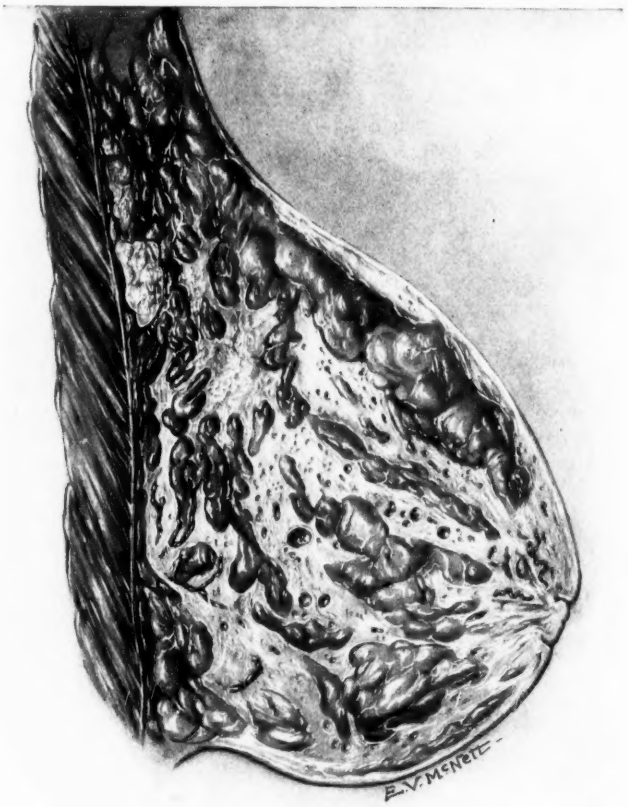

Fig. 9. Carcinoma with abnormal involution.

obliterated, leaving only an opaque mass more dense toward the central portion.

But it is rare to find only one central opacity in such cases for usually there has been an extension to other parts. Early extensions are shown by the X-ray as circular or oval areas of opacity with well defined borders lying here and there throughout the breast. These secondary shadows are thrown by the growths in lactiferous ducts and in lymphatic channels. Those in lymphatic channels are usually more or less linear in outline and striated in type with branching effects and also spread toward the lymphatics of the pectoral and axillary groups. The secondary areas in the earlier cases have sharply defined borders such as are seen in

Fig. 10. Carcinomatous metastasis.

the shadows cast by benign growths, but as they grow older they in turn contract as do the primary growths, giving them spicule-like borders as in the contracted primary growth. As the case progresses, there are more and more extensions and more and more secondary opacities, until numbers coalesce to form one great shadow, which in some cases may involve the entire breast triangle. This circular coalition of the many smaller areas explains the general whorling appearance of the shadows of the mass. (See Figs. 8 and 9.)

Due to the fact that many malignant tumors of the breast occur in women after the menopause, it is necessary to contrast the malignant breast with the normal breast of this particular period. As stated, the normal breast after menopause has a somewhat shrunken or contracted appearance with a compactness that is greater than that of the normal menstruating subject. As far as the compactness is concerned, that is, the increase in radiographic density, it is very much like that of the malignant breast and in some instances can hardly be differentiated. On the whole, the radiographic diagnosis is made on the following points: first, the location of the increased density. In the breast of the menopause, it has been found that, in general, the architecture follows that of the normal menstruating breast. In fact, its greatest density appears at or along the pectoral border in a more or less triangular outline, whereas in a malignant tumor the opacity may be in any shape or size, lying in any portion of the breast. The breast of the menopause practically always presents a single triangular opacity while a malignant breast often presents the multiple shadows. Second, after the menopause there is a general heavy lace-like, or what has previously been termed a surf-like, appearance at right angles to the linear striations of the breast triangle. Its density increases as we near the pectoral border, while in the malignant breast the architecture has more of a whorling character with fringed borders extending out in all directions into the surrounding tissues of the breast proper.

Metastasis is demonstrated in the pectoral and axillary lymph nodes as a faint opacity on the skiagraph, but it has also been found that an enlarged inflammatory lymph node will throw a similar shadow although not as heavy as that cast by the malignant node. It should therefore be borne in mind that all opacities in the pectoral and axillary lymph chain areas must not be considered evidences of metastasis. Since, however, it has been found that a normal lymph node will not throw a radiographic shadow, it follows that when there are opacities of irregular sizes in the region of the axillary and pectoral chains, it may be stated that there is pathology present in the area drained by these lymphatics, and that it is a malignant growth or an area of suppuration. To determine the difference between these two conditions, history, physical examination and radiography of the area drained by the nodes will practically always decide. Actually, a skiagraph of the main mass of the pathology will very often give the real diagnosis. The radiographic appearance of malignant lymph nodes is that of a chain of small, increased densities in the axilla and on the pectoral fascia. The only difference in the radiographic appearance of an inflammatory node as far as can be determined at present is perhaps that its shadow is somewhat less dense. (See Fig. 10.)

MALIGNANT CHANGES OCCURRING IN BENIGN GIANT CELL TUMORS OF BONE

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THE following paper is an analysis of the giant cell tumors of bone in the Registry of Bone Sarcoma previous to 1925. The study was undertaken chiefly to determine the results of treatment and to learn if they had any relation to the clinical or pathological findings. The cases registered prior to 1925 were chosen in order that at least 5 years should have elapsed since treatment in the most recent case. It was also felt that it would give a fairer idea of the frequency with which malignant changes took place than would be the case if patients dying of metastases were alone reported. It has been my misfortune to have seen 4 cases of giant cell tumor in which death occurred from metastases; 2 of these cases were in this series, while 2 others have been registered since 1925. Dr. Codman tells me he has also seen several cases, and I know of others, unpublished, occurring in other clinics. It seemed advisable, therefore, to determine what the actual facts were and whether the occasional case undergoing malignant changes was the exception that proved the rule or whether it occurred often enough to justify more radical treatment than is commonly recommended at present.

In analyzing the cases only those in which a microscopic slide was available for review were studied. There were 113 cases of giant cell tumor registered prior to 1925 which met this requirement. The majority of the Committee of the Registry has agreed to the diagnosis in all of these cases. Four of the 113 cases have been excluded; 2 of giant cell tumor of the phalanx in which the growth obviously originated in the tendon sheaths (441 and 609), and 2 which probably originated in the dura involving the vertebra secondarily (315 and 337). In addition to these 113, there are 12 other cases in which there was considerable difference of opinion among the pathologists as to the correct diagnoses, certain of the men classifying the tumors as "osteogenic sarcomata." These cases I have reviewed and accepted 7 as "giant cell tumors" while 5 were rejected (46-297-409-420-453). There are, therefore, 116 cases available for study. Four of these patients died of other causes without evidence of metastases less than 5 years from the date of treatment and are excluded, and no five year end-result was available on 30. There was one postoperative death.

TABLE I

	Cases
Died of intercurrent disease	4
No end-result	30
Postoperative death	1
Available for study of end-results	81
Total	116

The material available in the Registry has been studied carefully by several men and many of the individual cases have also been reported. The most complete review has been made by Kolodny. Codman, Ewing, and recently Geschickter and Copeland have also studied the material. There is little in the general study of giant cell tumor to be added to these works, and for a detailed analysis of etiology, pathology, etc., the reader is referred to the above articles.

Unfortunately, the history in many of the Registry cases is incomplete and the specimens small, poorly preserved, and from only one portion of the tumor. In determining the results the letter from the physician registering the case is all that is available, and while this states the patient is living there has been no check-up by X-ray to determine whether the growth has been destroyed and the cavity filled in by new bone, or whether the bone defect persists. If the latter is the case there is of course always the possibility of a recurrence of the disease.

ETIOLOGY

Sex. The disease was slightly more common

Fig. 1. Registry Case 295. Giant cell tumor of upper end of the femur. Roentgenogram taken in June, 1922, by the patient's family physician, on which a diagnosis of tuberculosis was made. (Fig. 96 from Kolodny.)

Fig. 2. Registry Case 295. Roentgenogram taken in April, 1923. At the time of admission to the hospital the entire head, neck, and upper end of the femur had been destroyed by the tumor. (Fig. 1.)

in females than in males. There were 53, or 45.5 per cent, males; and 63, or 54.5 per cent, females. This was true in all bones with the exception of the femur. In the femur, the growth occurred in 16 females and 20 males.

The tumor was situated in all cases in the epiphyseal ends of a long bone, the lower end of the femur being most commonly affected. Next in the order of frequency were the upper end of the tibia, lower end of radius, and the upper end of the humerus.

The effect of trauma as an etiological factor was noted in 84 cases; 54 or 64.3 per cent had sustained some form of injury prior to the appearance of the tumor, while in 30 the fact was stated that no trauma had been received. Pathological fracture was an early symptom in 14 cases.

Age. The disease occurred at all ages but was more common in young adults than in children. It was most frequent in the decade between 20 and 30. When situated in the jaw, the average age was somewhat younger. The youngest patient was 4 years, the oldest 68 years, while 16 per cent of the cases occurred after 40 years. On plotting the ages the curve was found to correspond almost exactly to the curve that was given by Kolodny.

TABLE II.—BONES INVOLVED

Femur	36	Ulna	5
Tibia	24	Ribs	2
Fibula	3	Jaws	10
Humerus	8	Vertebra	4
Radius	12	Other bones	12

In other bones are included: scapula 3, ischium 1, phalanges 2, astragalus 2, metacarpal 1, sacrum 1, skull 1, and metatarsal 1.

PATHOLOGY

The tumor is essentially a destructive process with bone absorption and relatively little bone proliferation. It originates in the medulla and extends to the cortex which becomes thin and expanded. Kolodny states that new bone is laid down by the periosteum as the new layers of the cortex are absorbed, but the entire thickness of the cortex may be destroyed and the tumor contained in a fibrous envelope composed of periosteum. There is much discussion as to the exact nature of the tumor. Mallory considers giant

Fig. 3. Registry Case 295. Roentgenogram taken in April, 1924. This plate was taken after one series of high voltage X-ray treatments given in the spring of 1923. The tumor has diminished in size and new bone has been laid down (see Figs. 1 and 2). Roentgenogram showed no change in the tumor from this date until September, 1929. The patient worked as a day laborer from 1924 to June, 1929. (Fig. 97, from Kolodny.)

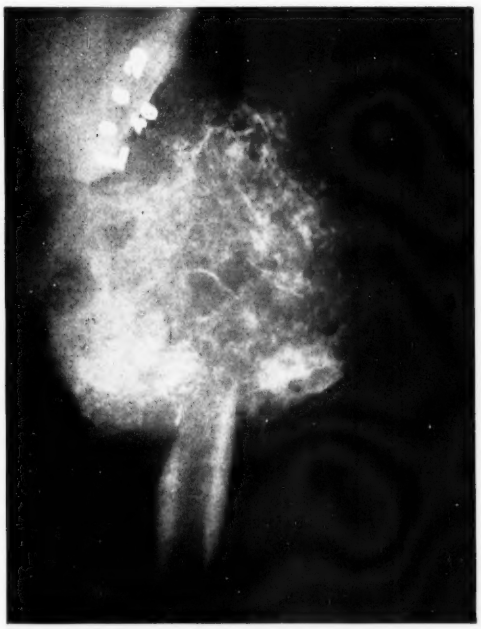

Fig. 4. Registry Case 295. Roentgenogram taken in September, 1929. This shows increase in the size of the tumor with absorption of bone and pathological fracture. (Compare with Figures 1, 2, and 3.)

cell tumor as simple granulation tissue, while other observers believe that they are true tumors. Whether this is the same type of giant cell tumor that is seen associated with cases of Paget's disease of the bone it is impossible to say from the data on hand.

The growths were encapsulated unless there had been a pathological fracture. The joint cartilage was apparently very resistant and the joint not involved in any case. This was not true, however, of the epiphyseal cartilage and one may be misled into making the diagnosis of osteogenic sarcoma by finding portions of this structure in the tumor. There was also no infiltration down the medullary canal, the line of demarcation between normal medulla and tumor being abrupt. Certain bony trabeculæ may persist in the growth and give the radiogram a characteristic appearance but they usually do not extend through the entire tumor. In gross, the appearance of the tumor varied considerably. This difference may be due to the age of the tumor, but is also affected by trauma or pathological fracture. Different portions of the same tumor may also vary widely in appearance. Many of the tumors were described as being "very vascular" and having the typical "currant jelly" appearance on section. The older tumors showed evidence of fibrosis either as the result of treatment, fracture, or advancing age.

The appearance of the tumor also varied, depending on the bone involved. In the lower end of the femur it was usually seen in the external condyle which often showed evidence of collapse. In the humerus, Codman has called attention to two types; one centrally placed while the other apparently originates in the greater tuberosity. These tumors are mostly on the external aspect of the bone. In the phalanx the entire bone was involved when the patient was first seen.

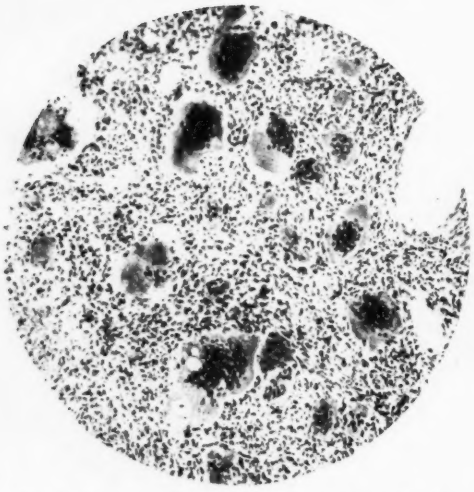

Fig. 5. Registry Case 295. Photomicrograph from biopsy of the tumor made in April, 1923. Low magnification. Typical appearance of benign giant cell tumor.

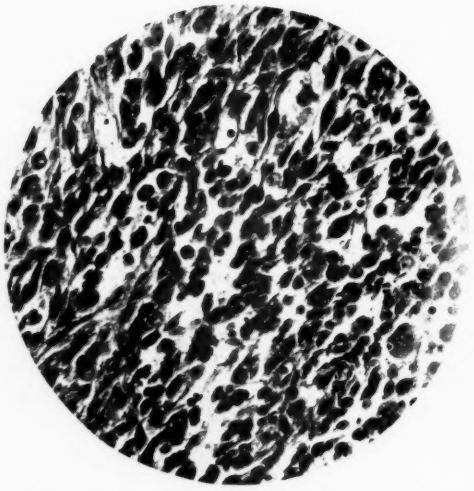

Fig. 6. Registry Case 295. Photomicrograph of metastatic nodule from the lung. Medium magnification. This shows a rapidly growing, highly malignant sarcoma. Sections from the tumor of the thigh were of a similar character.

Kolodny has attempted to distinguish types of giant cell tumor and considers four varieties:

1. Simple giant cell tumor.
2. Xanthoma.
3. Myxomatous.
4. Telangiectatic.

He believes that these are all forms of the same tumor and found that the pathological

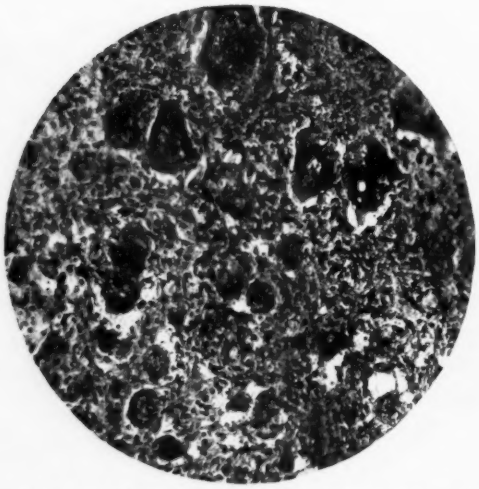

Fig. 7. Registry Case 68 (Case 2 of Geschickter and Copeland). Section from the tumor of the lower end of the radius which was removed in July, 1929. Low magnification. The section is entirely typical of benign giant cell tumor.

Fig. 8. Registry Case 68. Photomicrograph of section from the tumor of the lower end of the radius at the time of amputation in September, 1923. High magnification. Section shows sarcomatous type of spindle cell, with many mitotic figures (see Fig. 7).

appearance was of little clinical importance. Geschickter and Copeland come to the same conclusion. The appearance varies according to the age of the tumor, previous treatment, and trauma. Different portions of the same tumor may show an entirely different type of growth. It is this fact that makes it difficult to draw conclusions from the small sections present in the Registry. Cartilage, osteoid tissue, and new formed bone are often seen although clinically the cavities do not tend to become obliterated by new bone as a result of treatment. *The mere fact that osteoid tissue and new bone is present should not lead one to make the diagnosis of osteogenic sarcoma.*

When situated in the upper end of the humerus, the tumors are apt to differ microscopically from the usual form. They all contain large cells suggesting cartilage and at first glance appear as a malignant tumor. All these cases, however, have been cured by conservative treatment. In the flat bones and jaw the course of the disease is different from that in tumors which are situated in the long bones. In the jaws, tumors that suggest osteogenic sarcoma, and if in a long bone probably would be clinically malignant, may be benign.

In analyzing the specimens, microscopically, the following points were noted:

1. Giant cells—foreign body or tumor form.
2. Round cells—tumor cells or infiltrative cells.
3. Spindle cells.
4. Endothelial leucocytes (foam cells).
5. Relative number of cells in mitosis.
6. New bone—normal or tumor bone.
7. Cartilage or osteoid tissue.
8. Blood vessels—tumor blood vessels or normal blood vessels.
9. Necrosis and hæmorrhage.

The names of the various cells are self-explanatory in most instances. The so-called "foam" cells are phagocytic endothelial leucocytes containing lipoid detritus and if present in large numbers give the tumor a yellowish tinge.

The different microscopic structures apparently had no relation to the prognosis of the tumor. Of the entire group there were 19 cases where some question had arisen in the minds of certain members of the Committee that the disease might be malignant. In studying these cases, the results were found to be the same as those in which there was no question as to the diagnosis.

TREATMENT

The treatment of the cases varied within wide limits. Eighty-two cases were available for study of which 6 died of metastases. These 82 cases received 20 different forms of treatment or combinations of treatment. It will be seen, therefore, that there is no standard treatment. The cases are spoken of as "well" or "cured," but few are accompanied by X-ray pictures to show the actual condition of the bone; that is whether the growth is arrested and appears as a cavity crossed by more or less trabeculæ of bone, or whether the distended bone presented a normal appearance and the cavity was entirely replaced by cancellated bone. It is doubtful if this ever occurs.

TABLE III.—ANALYSIS OF CASES

Total no. of cases	116
No end-result	30
Died other causes	4
Available cases	82
Died with metastases	6

TABLE IV.—TREATMENT

Amputation	13
Curetting—amputation	5
Curetting—radiation—X-ray—amputation	3
Toxins—amputation	1
X-ray—amputation	1
Curetting	19
Curetting—radiation	3
Curetting—radiation—toxins	3
Curetting—toxins—amputation	3
Curetting—X-ray	2
Curetting—resection	2
Curetting—radiation—curetting	1
Curetting—toxins	4
Curetting—radiation—toxins—curetting	1
Excision	4
Resection	7
Biopsy—X-ray	2
Biopsy—toxins	3
Biopsy—radium	5
	82

Amputation. Amputation as a primary operation was performed 13 times and 10 of these operations were done for tumor about the knee joint. The 3 remaining were one

each of the lower end of the radius, lower end of the ulna, and a phalanx. All these cases are living without disease 5 or more years later.

Pathologically they varied considerably, many were very fibrous but the greater number were typical giant cell tumors. The appearance in 1 case was somewhat suggestive of osteogenic sarcoma (Case 119—radius).

Amputation was also performed 13 times as a secondary operation, as other treatment had failed to cure the condition; of these 2 are dead of metastases (Nos. 68 and 349). In both of these cases the specimens from the first and second operation were available for comparison. They showed an entirely different type of tumor. There is some question as to the actual cause of death in Case 68, but I saw this patient in consultation and she had positive clinical evidence of lung metastases.

TABLE V.—RESULTS OF AMPUTATION—TWENTY-SIX CASES

Amputation primary cases	13	Amputation as other treatment failed	13
Dead	0	Dead	2
Well	13	Well	11

In reviewing the cases it would seem that in giant cell tumors amputation when done as a primary operation resulted in a cure in 100 per cent of the cases, and that unless the character of the growth had changed from giant cell tumor to an osteogenic sarcoma secondary amputation should also result in a cure.

Resection and excision. Resection or excision was performed 13 times (excision 4—resection 7)—11 times as a primary treatment and in 2 other instances as curetting had failed to cure the disease. Resection was performed for tumor of the femur, tibia, radius, and ulna, 1 case each, and lower jaw 2 cases. All of these patients are well 5 or more years after operation. Excision was performed 4 times followed in one instance by death with lung metastases. There was no local recurrence. The cases were situated 1 each in the femur, fibula, vertebra, and scapula. The death occurred in the case of giant cell tumor of the scapula. The diagnosis was questioned in this case by certain members of the Committee (scapula—63), as the tumor showed distinct activity in some sections. I believe that the giant cells are both of the tumor and of the foreign body variety and that the tumor was an osteogenic sarcoma.

To sum up, resection of a giant cell tumor in the long bones when practical is followed by 100 per cent cures, that is the prognosis is as good as in amputation and the results in excision, that is complete removal of the growth were equally satisfactory, since the patient dying of metastases had no local recurrence.

TABLE VI.—RESULTS OF EXCISION AND RESECTION—THIRTEEN CASES

	Cases	Dead with metastases	Well
Excision	4	1	3
Resection	7	0	7
Resection as secondary operation	2	0	2

Curetting. Forty-six cases were curetted as a primary treatment. There was 1 postoperative death from hæmorrhage. How thorough an operation was performed in each case and whether the curetting was followed by cauterization of the cavity or not is impossible to state from the data available. In 17 cases a cure was effected by this method of treatment alone (37 per cent). Twelve other cases in which the curetting was followed by radiation treatment or by the administration of Coley's toxins remained well. These cases might perhaps have been cured by curetting alone. Including them there are, therefore, 29 cures in 46 patients or 63 per cent. Taking the group as a whole, 4 patients died of metastases and one of postoperative hæmorrhage

In 16 cases in which the primary curetting, or curetting followed by radiation or toxin treatment, did not cure the tumor 11 eventually came to amputation and 2 to resection, while many had a secondary curetting.

The most striking cases in this group are the giant cell tumors of the upper end of the humerus, previously mentioned, which apparently originate in the epiphysis of the greater tuberosity. These were all cured by a conservative operation. Two notable examples of these are Cases 86 and 5. Certain similar cases have been included in Phemister's group of chondrosarcoma.

The following table gives the results of the cases treated by curetting:

TABLE VII.—RESULTS OF CURETTING—FORTY-SIX CASES

	Cases	Died re-currence	Post-operative death	Well
Curetting	19	1	1	17
Curetting—amputation	5	1		4
Curetting—radiation—amputation	3	1		2
Curetting—toxins—amputation	3			3
Curetting—radiation	5			5
Curetting—(multiple) radiation	1			1
Curetting—radiation—Coley's toxins	3			3
Curetting—resection	2			2
Curetting—Coley's toxins	4	1		3
Curetting—(multiple) toxins—radiation	1			1
	46	4	1	41

Radiation. Specimens were available for review in only 8 cases which were radiated as a primary treatment; one of these cases had an amputation performed later (tibia, No. 320), and 1 in which the treatment was apparently successful died of local recurrence, and lung metastases 6 years later. Radiation treatment, therefore, in this group of 8 cases resulted in a cure in 6 instances (or 75 per cent). How often there is an error in diagnosis or a change in the character of the tumor it is impossible to state, as in most cases treated by radiation the diagnosis is of necessity clinical only. I know of 3 other cases not in this series in which 5 or more years after presumably successful radiation treatment the growth showed renewed activity and presented evidence of metastases. In none of these was the clinical diagnosis confirmed by the microscope. Two of these cases are registered (No. 566 and No. 917). The third has not been as yet.

In 13 other cases radiation was employed in conjunction with curetting. Three of these cases later came to amputation of which one is dead of lung recurrence (tibia, No. 349). In this case as well as in Case 295, in which death also resulted from lung metastases, a comparison of the specimen removed at the first operation showed an entirely different type of tumor from that removed at the second. In the few instances where X-ray plates were available after the radiation treatment different pictures were presented. In certain cases the cavity remained but the appearance was different from that of an untreated giant cell tumor; the trabeculæ were not in evidence and the defect in the radiogram had a mottled appearance as if there were many small areas of incomplete ossification. In other cases the tumor appeared to have shrunk, but had the general appearance of a giant cell tumor. In still others the cortex appeared to be thicker and the defect, although present, smaller.

To sum up, of 8 cases receiving radiation as a primary treatment 1 died of lung metastases, and 1 had an amputation performed later. Of the entire group, including the cases in which radiation was given in conjunction with some other form of treatment, 21 cases, 4 subsequently had an amputation and 2 died of metastases, while 15 were cured (73 per cent).

TABLE VIII.—RESULTS OF RADIATION—TWENTY-ONE CASES

X-ray	2*
X-ray—amputation	1
Curetting—X-ray	2
Curetting—X-ray—radium—amputation	3*
Radium	5
Curetting—(multiple radium—toxins)	4
Curetting—radium	9

*1 dead metastases.

Coley's toxins. Fourteen cases received Coley's toxins. In 3 instances it was the only treatment, while in 11 cases it was given in conjunction with curetting and 3 of these eventually had the limb amputated. In 1 case the toxin treatment was supplemented by curetting, but the patient died with clinical evidence of metastases (vertebra, No. 472). The specimen in this case is very unsatisfactory but suggests giant cell tumor and not osteogenic sarcoma. In 1 other case Coley's serum was given as a prophylactic following amputation.

To sum up, 14 cases received the toxin treatment. In 3 cases it was the only treatment employed and these patients were living 5 years later. In 11 others it was used in conjunction with a surgical operation. One of these died of metastases while 3 required subsequent amputation. Of the remaining 7 cured by curetting and toxin treatment, it is

unfair to state which method accomplished the result. Excluding these 7 patients, we have 7 patients treated by the toxin of which 3 were cured, 1 died of metastases, and 3 required amputation later (42 per cent cures).

TABLE IX.—RESULTS OF COLEY'S TOXINS—FIFTEEN CASES

Toxins only	3
Toxins—curetting	5
Toxins—radiation—curetting	3
Toxins—curetting—amputation	3
Toxins (after amputation)	1
	15

DEATHS FROM DISEASE

Six patients died presumably of metastases, a mortality of 7.5 per cent.

ABSTRACTS OF CASES

Registry No. 63. Male, aged 63 years. A tumor of the scapula was excised in 1920. Patient died in July, 1921, with clinical evidence of metastases in the lungs.

A review of this specimen shows a cellular tumor containing many foreign body giant cells, but there are, however, many cells in mitoses and multinucleated tumor giant cells as well as tumor blood vessels. The opinion of the Committee varied, certain of the members considering the growth an osteogenic sarcoma. The sections illustrate the fact that diagnosis of giant cell tumor should not be based on the presence of foreign body giant cells alone.

Registry No. 68. (Case No. 2 of Geschickter and Copeland.) Radius. Female, aged 69 years. Tumor was curetted four times between July, 1920, and July, 1922. Patient also received radium and X-ray treatment. Amputation was performed in September, 1923. Patient died December, 1923, after a brief illness, with clinical evidence of lung metastases. No X-ray examination of chest was made. No autopsy was obtained (see Figs. 7 and 8).

There is some doubt as to the actual cause of death in this case. The patient was an elderly woman and the question arose whether death was caused by metastases or by pneumonia and cardiac decompensation. I saw this patient, however, and believe that she had pulmonary metastases. Sections from the specimen removed at the first curetting are unquestionably giant cell tumor. Sections made at the time of amputation 2½ years later showed the specimen to be very fibrous and composed of spindle cells without foreign body giant cells; in other words a tumor of an entirely different character. Geschickter and Copeland considered that this represents a healing reaction. It suggests, however, the specimens from Cases 349 and 295, and I believe is a malignant tumor.

Registry No. 295. (Illustration Kolodny's article Figs. 96 and 97.) Upper end of femur. Male, aged 24 years. Onset was in June, 1922. Biopsy examination made and X-ray treatment began April, 1923. Microscopic examination of the specimen showed typical giant cell tumor. Remarkable improvement followed high voltage X-ray treatment and patient was considered cured. He worked as a day laborer until June, 1929, when the deformity at the hip joint increased and two nodules appeared in the skin of the leg. One of these was excised and proved to be highly malignant sarcoma. The nodule recurred but disappeared under radiation treatment. The tumor in the hip increased in size and in November there was evidence of lung metastases. The patient died in February, 1930. Autopsy showed highly malignant osteogenic sarcoma of the upper end of the femur with lung metastases (see Figs. 1, 2, 3, 4, 5, and 6).

There is no question that the tumor from which the first specimen was removed in 1923 was a giant cell tumor, and that there was marked improvement following radiation treatment. The tumor found at autopsy was a typical osteogenic sarcoma.

Registry No. 349. Case reported by Drs. Stone and Ewing (Case 7 of Geschickter and Copeland). Male, aged 15 years. A tumor at the upper end of the tibia was curetted in June, 1919. In July, 1919, radium treatment was given. In June, 1920, a mid-thigh amputation was done. In February, 1921, patient died with clinical and X-ray evidence of pulmonary metastases. Sections of tumor removed in 1919 showed typical giant cell tumor; those from the growth in 1920 typical osteogenic sarcoma.

Registry No. 472. Female, aged 17 years. Tumor of vertebra, result of trauma in 1920. Curetting was done and Coley's toxins were given in 1922. Death resulted from metastases to other bones. Date is not given.

The sections available for review in this case are poor, but suggest giant cell tumor. There is no X-ray picture.

Registry No. 518. Female, age not stated. No X-ray plates are available. The tumor was located at the upper end of the tibia and had appeared

shortly after trauma. The tumor was curetted or partially excised in 1924. The patient was dead in 1928, presumably of metastases.

The specimen removed at the operation showed a typical giant cell tumor. The diagnosis was not questioned by members of the Committee.

SUMMARY

In analyzing these cases it is seen that there is no instance in which a proved giant cell tumor formed metastases. Cases 295, 349, and 68 show that the giant cell tumor may change its character and become osteogenic sarcoma which metastasizes in the usual manner and causes death. Whether a giant cell tumor may be malignant or whether it may change its character and cause death is a purely academic question as far as the treatment and the patient is concerned. A giant cell tumor is known to become an osteogenic sarcoma in about 3.7 per cent of the cases. It is said that repeated trauma in the way of multiple operations may induce this change from benign to a malignant tumor, but, after the biopsy, Case 295 was treated by radiation and certainly was not irritated for 6 years. If we consider the embryonic fibroblast which can differentiate into fibrous tissue, bone, cartilage, muscle, etc., as being the important cell in all these mesoblastic tumors, it is not difficult to conceive of marked changes taking place in the character of the growth. I believe that Case 63 was an osteogenic sarcoma containing foreign body giant cells as well as tumor giant cells. The data on Cases 472 and 518 is incomplete but the sections show giant cell tumor and do not suggest osteogenic sarcoma, and both patients presumably died of metastases. The cases cannot be classified as metastasizing giant cell tumors for changes similar to those in 295, 349, and 68 may have taken place.

The term "cure" is used to denote the fact that the patient is living 5 or more years after treatment, but whether the disease is eradicated or in a quiescent stage it is impossible to state from the data available. The fact that in Case 295, a growth apparently cured, showed renewed activity and caused death 6 years after treatment should make us cautious in employing the term "cure."

From an analysis of this group of cases, it is seen that the chances of cure are not as great as one is lead to believe from many of the articles published, when conservative treatment is employed. On the other hand, death from the disease does not occur in more than at most 7.5 per cent of the cases and it is a question, therefore, if amputation is justifiable. I believe that resection should be practiced when possible, as the results are as good as those following amputation and better than when following any other method of treatment. Resection is practicable in only certain of the long bones: the radius, ulna, fibula, ribs, lower jaw, and humerus, and, if necessary, the deformity can be partly overcome by bone graft. In the other bones the choice of treatment lies between amputation on the one hand, and radiation or curetting and cauterization on the other. The relatively low percentage of cases in which the growth changes its character and causes death would seem to make the more conservative treatment advisable, but the fact that the patient may require multiple operations and possibly die of the disease must be borne in mind. It is impossible to determine from this small group of cases if radiation treatment or curetting is to be advised in tumors of a given bone.

CONCLUSIONS

1. Amputation cures 100 per cent of the cases of giant cell tumor.

2. Resection or complete excision can be expected to cure 100 per cent of the cases. The only patient dying of the disease treated in this manner had no local recurrence, which is all that can be expected of the operation, and there is also some doubt as to the correct diagnosis in this case.

3. Curetting cures 63 per cent of the cases. Combined with other treatment, as radiation, 72 per cent.

4. Radiation treatment alone cures 75 per cent of the cases.

5. Treatment by Coley's toxins cured 42 per cent of the cases (data based on 7 cases).

6. Of the cases of accepted benign giant cell tumor treated conservatively 7.5 per cent died, presumably of metastases.

7. In 3 cases in which it was possible to compare microscopic sections of the tumor first treated with that causing death, the character of the growth had changed from benign to malignant.

8. There is no proved instance in the cases of giant cell tumor in the Registry of Bone Sarcoma, registered before 1925, of a tumor of this type causing death from metastases. There is definite evidence, however, that a benign giant cell tumor may change its character and become an osteogenic sarcoma causing death. Uncontestable data is difficult to obtain, but this change is known to have occurred in 3 cases in this series, 3.7 per cent, 1 case of which was proved by autopsy, and it may have taken place in 2 other cases, 6 per cent.

9. The type of giant cell tumor as determined by the microscope apparently has little relation to the prognosis.

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PERSISTENT BRONCHIAL FISTULA

Experimental Production and Method of Treatment[1]

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BRONCHIAL fistulæ following surgical procedures or diseased conditions of the lung, close spontaneously in a very high percentage of cases. However, when a bronchus of a considerable diameter is severed during partial pneumectomy, a persistent bronchial fistula is apt to result. Graham reported 45 cases of cautery pneumectomy, 31 or 69 per cent of which became symptom-free with 10 or 33 per cent having persistent bronchial fistulæ.

ETIOLOGY OF PERSISTENT BRONCHIAL FISTULA

Several factors have received attention in considering the etiology of this condition. (a) The lumen of a persistent fistula is usually lined by either a stratified epithelium, squamous to columnar in type, or by chronic unhealthy granulation tissue. Investigation of the reparative processes of bronchi of dogs following an injury (1), revealed the bronchial epithelium regenerating very rapidly. The rate of regeneration was such that before the defect left by the necrosing action of the injurious agent could be filled in with granulations, the enlarged air passage had become relined with new epithelium. Similar observations were made by Winternitz during influenzal studies on rabbits. Thus simple destruction of the epithelial lining of a fistula would be followed by rapid regeneration rather than closure of the sinus. (b) Examination of the wall of a persistent fistula reveals a firm, rigid, non-collapsible structure consisting of dense fibrous tissue. The lumen thus being kept open is thought to be an important factor in preventing a closure. (c) A very high percentage of bronchial fistulæ exhibit a continuous or intermittent discharge. The source of this may be at the inner end of the fistulous tract or at any point along its tortuous course which may be inadequately drained. Undoubtedly, this continuous reinfection plays a major rôle in preventing a closure of the pathological sinus.

EXPERIMENTAL PRODUCTION

The experimental production of persistent bronchial fistulæ in dogs was carried out by Pool and Garlock. They reported great technical difficulties accompanying the procedure with tendency of the fistulæ to close spontaneously. Their method entailed the use of a two-stage operation at the first of which a segment of rib with intercostal muscle and periosteum was removed and the underlying lung sutured to the parietal pleura over an area 1.25 inches in diameter. At a second operation 2 weeks later, the lung was entered by blunt dissection and, on reaching a fair sized bronchus, we sutured the bronchus to the skin edges. The fistula thus formed was kept patent with difficulty by frequent applications of phenol.

The experiments that follow deal with the production of bronchial fistulæ, the persistent bronchial fistulæ, and a method of closure of persistent fistulæ.

Medium sized dogs were used (11 to 13 kilogram) in the experiments, and the operations were carried out under ether anæsthesia with a small pre-operative dose of morphine and atropine. A two-stage operation was performed as follows: At the first operation, about 75 per cent of the middle lobe of the right lung was delivered outside the chest wall and secured to the intercostal muscles by a row of silk sutures. The soft parts were then closed in layers outside the lobe of the lung. At a second operation 2 weeks later, the portion of the lung lobe outside the chest wall was amputated with the actual cautery. Into the main bronchus of the lobe thus exposed, a rubber tube about 0.6 centimeter in diameter was introduced for a distance of 2.0 or 3.0 centimeters. The skin edges were closed about the tube which was secured in

[1] This work has been conducted under a grant from the Douglas Smith Foundation for Medical Research of the University of Chicago.
A preliminary report of this study was published in Soc. Exper. Biol. & Med., 1930, xxvii, 351.

place by means of a safety pin and body cast. The wound was dressed daily and the body cast was removed in 2 or 3 weeks following the second operation. The experiments were concluded by electrocution (11) to avoid agonal phenomena. The specimens obtained were examined both grossly and microscopically.

Protocol 1. September 20, 1929. Dog No. 294B, weighing 9.5 kilograms, was given morphine 0.015 gram and atropine 0.0004 gram before operation. The right chest was prepared for operation by shaving and by application of tincture of iodine. Under intratracheal ether anæsthesia an incision about 2 inches in length was made over the posterior half of the right sixth rib. This was carried down to the rib, of which 2 inches were resected subperiosteally. A longitudinal incision was now made in the rib bed 1.5 inches in length (Fig. 1) and 75 per cent of the right middle lobe of the lung was delivered outside of the chest wall under positive pressure ether anæsthesia (15). The lobe was secured in this position by a single row of continuous silk suture (Fig. 2). The muscle, subcutaneous tissues, and skin were then closed in layers outside the lung lobe, catgut being used for the muscle and fascia, and interrupted linen for the skin. A dressing was applied and was secured with collodion. The postoperative condition was good.

September 21, 1929. The dog was quiet and would not eat. Appeared ill.

September 22, 1929. Appeared ill. Did not eat but walked about in cage.

September 23, 1929. Better today. Wound clean.

September 25, 1929. Dog up and walked about. Ate well. Wound clean.

September 27, 1929. Appeared entirely well.

September 30, 1929. Wound healed.

October 4, 1929. Morphine, 0.015 gram, and atropine, 0.0004 gram, were given before operation. Under intratracheal ether anæsthesia an incision about 1.5 inches in length was made in the region of the scar of the first operation. This was carried through the skin, subcutaneous tissue, and muscle. The right middle lung lobe was located and separated from the surrounding tissues by blunt dissection down to the row of silk sutures. It was then amputated with the actual cautery at a point just distal to the silk sutures (Fig. 3). Hæmostasis was easily obtained with the cautery. Into the main bronchus of the lung lobe thus exposed, a rubber tube 0.6 centimeter in diameter was introduced for a distance of 2.0 to 3.0 centimeters. The skin was then closed over the stump and around the tube by interrupted linen sutures (Fig. 4). The tube was secured by a safety pin and, after dressing the wound, a body cast was applied. Postoperative condition good.

October 5, 1929. The dog appeared ill, and did not eat.

October 7, 1929. Hole cut in cast over wound and tube found in proper place. Wound cleaned with iodine and alcohol. Cast reinforced.

October 9, 1929. Wound infected. Tube in place.

October 10, 1929. Cast changed. Wound still infected. Cleaned with iodine and alcohol.

October 12, 1929. Same. Dressings changed.

October 14 to 18, 1929. Wound infected but healing. Dog otherwise appeared well.

October 19, 1929. Cast taken off and the tube removed. Bronchial fistula present and much infected.

October 20 to December 20, 1929. Fistula observed daily. It remained patent, did not decrease in size, and discharged a small amount of purulent material.

December 20, 1929 to February 1, 1930. Fistula observed daily. Continued to be patent and of original size. Was discharging purulent material at all times.

February 1 to August 31, 1930. Fistula observed daily. During this period it remained of quite uniform size (1.0 by 0.75 centimeter), and discharged a small amount of purulent material (see Fig. 5).

August 31, 1930. Sacrificed by electrocution.

RESULTS

The results of 11 experiments as described above are as follows:

Two dogs died on the second day following the second operation; one due to hæmorrhage from clawing the wound through an opening eaten in the cast, the other presented no demonstrable cause of death.

THE PERSISTENT FISTULA

Three of the 9 remaining dogs were sacrificed at the end of 6, 11, and 11 months respectively. One of the animals retained a persistent bronchial fistula of 1.0 by 0.75 centimeter throughout the entire experiment of 11 months' duration. The fistula of the other dog sacrificed at 11 months ceased to discharge on two occasions and began to close spontaneously which necessitated reinfection by introduction of a dry pack into the fistula. It ceased to discharge completely and closed spontaneously just before sacrificing. The 6 month specimen also ceased to drain and began to close spontaneously on three occasions at which time a dry gauze pack was introduced into the fistula followed by reinfection and discharge of pus. At the time of sacrifice, the fistula was its original size and discharging pus.

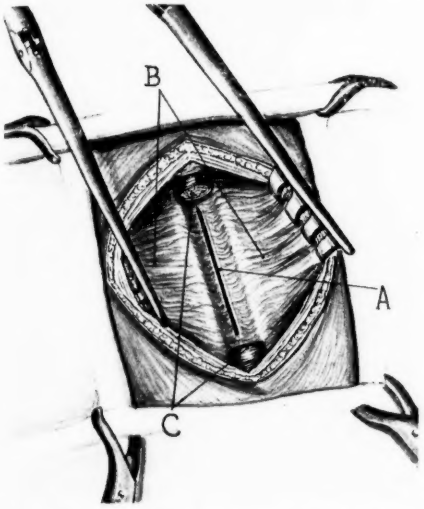

Fig. 1. First stage operation for experimental production of bronchial fistula. *A*, Longitudinal incision in rib-bed; *B*, intercostal muscles and parietal pleura; *C*, ends of rib following subperiosteal resection.

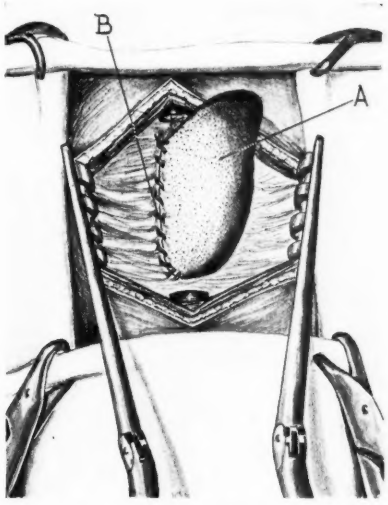

Fig. 2. First stage operation for experimental production of bronchial fistula. *A*, Right middle lung lobe drawn out through opening in rib-bed and secured by a single row of silk sutures at *B*.

Gross pathology. At autopsy the external opening of the persistent fistula was oval in shape and measured 1.0 by 0.75 centimeter. The adjacent lung lobes were adherent to the lobe containing the fistula and chest wall at the site of operation by quite dense fibrous adhesions. On dividing the fistulous tract, it was found to be fairly uniform in diameter throughout its course. However, a small recess was located between the lung lobe and

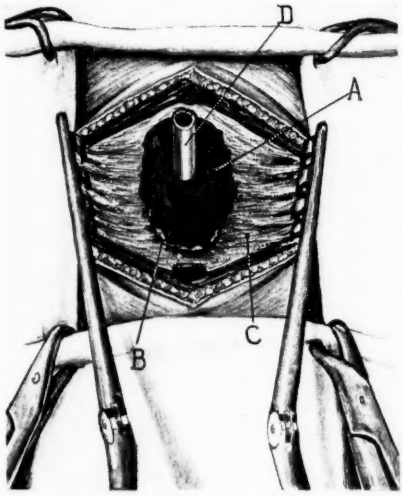

Fig. 3. Second stage operation for experimental production of bronchial fistula. Note *A*, stump of amputated lung lobe; *B*, line of suture just proximal to where amputated; *C*, intercostal muscles and fibrous adhesions; *D*, rubber tube in main bronchus of lobe.

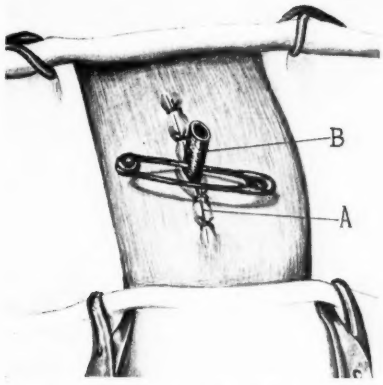

Fig. 4. Second stage operation for experimental production of bronchial fistula. Showing *A*, skin closed around tube *B*, which is located in main bronchus of lung lobe.

Fig. 5. Dog No. 294B. Persistent bronchial fistula *in vivo* of 9.5 months' duration with no tendency to spontaneous closure at any time. Upper right is a close-up view. The fistula measured 0.75 by 1.0 centimeter.

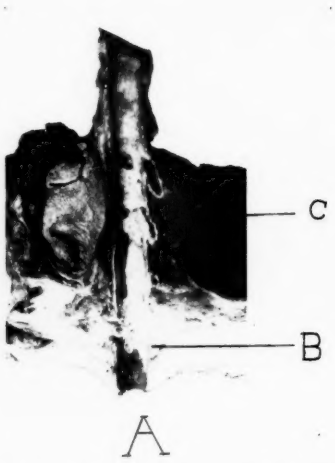

Fig. 6. Dog No. 369C. Photograph of pathologic specimen of a persistent bronchial fistula sacrificed at the end of 25 weeks' duration. Note *A*, external opening of fistula; *B*, recess lying between osteum and lung tissue; *C*, lung.

skin surface and extended around the entire circumference of the fistula, in which purulent material was found (see Fig. 6).

Microscopic pathology. The fistulous tract was lined by a stratified epithelium which varied from squamous to columnar in type. There was no sharp line of demarcation between the two types; the squamous extended three-fourths of the distance inward toward the lung in some parts and the columnar extended three-fourths of the distance outward toward the skin surface in others. The lining epithelium lay on a fibrous tissue base (Figs. 7, 8, and 9).

CLOSURE OF THE FISTULA

The treatment of persistent bronchial fistula dates back to Hippocrates who is quoted as "having given up in despair" and advised "letting nature take its course."

Graham (6) found in his experience that it was better to wait for a period of months or years before attempting to close the fistula. The many procedures reported for the cure of persistent bronchial fistula suggest its stubborn resistance to any form of therapy. Such procedures as mobilization of the lung (5, 10, 13), cauterization of the lining of the fistula, pedicle muscle graft (13, 16), fat and fascial transplant (9), and suture of the fistula (5, 9, 13) have been reported to have produced satisfactory closure of persistent bronchial fistula in individual cases.

From studies on the healing of bronchi Bettman concluded that the healing was due to peribronchial tissue. It was also noted that both Lilienthal and Joannides, in doing experimental lobectomies, left a liberal amount of parenchymal tissue in order to obtain a successful closure of the stump. Robinson and Sauerbruch (quoted by Bettman) were unable to perform pneumectomies on dogs due to lack of healing of the bronchial tissue. In some experiments on bronchial injury and repair (1), in which the entire bronchial wall was destroyed, it was found that there was only regeneration of the lining epithelium, and this occurred rapidly.

Recent further studies have been made on the repair of bronchi following injury (2, 3) in which various percentage strengths of silver nitrate were used. Complete stenosis of a bronchus 1.0 centimeter in diameter followed the application of 35 to 50 per cent quite routinely in from 2 to 3 weeks. On the basis of these experiments, it seemed reasonable to believe that a persistent bronchial fistula might be stenosed in a similar manner.

Accordingly, 6 of the above produced persistent fistulæ, after having progressed for 5 months, received a single application

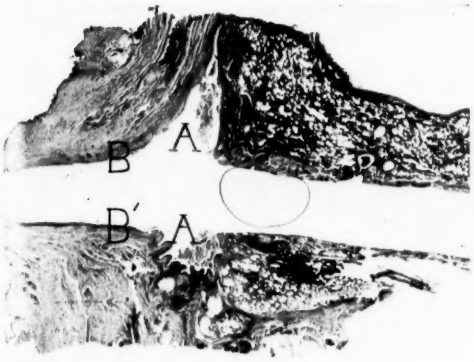

Fig. 7. Dog No. 369C. Microscopic appearance of fistula seen in Figure 6. Note recess *A* between osteum and lung tissue (×4).

silver nitrate solution, introduced to a depth of 1.5 centimeters into the fistulous tract. In 3 dogs 35 per cent was used, and in the remaining 3 a 50 per cent solution was applied. A constant discharge from the fistula was present in each case at the time of application of the silver nitrate. Prompt closure of the fistula took place in all cases in from 8 to 14 days, it being slightly more rapid following the 50 than the 35 per cent. The animals were sacrificed 3 to 5 weeks following closure of the fistula.

Gross pathology. At autopsy the distal portion of the fistula ended blindly beneath the skin. This closure appeared to be brought about by dense fibrous tissue (Fig. 10).

Microscopic pathology. The blind end of the fistula was lined by stratified columnar epithelium and showed some evidence of polyp formation. The region between the blind end of the fistula and the skin surface was composed of fibrous and adipose tissue (see Figs. 11, 12, 13).

DEDUCTIONS

Persistent bronchial fistulæ which are acting as a safety valve for some obscure suppurative process obviously should not be closed. On the other hand, large empyema cavities, or cavities remaining following partial pneumectomy into which several bronchial fistulæ open, are very difficult to heal without first closing the bronchial openings.

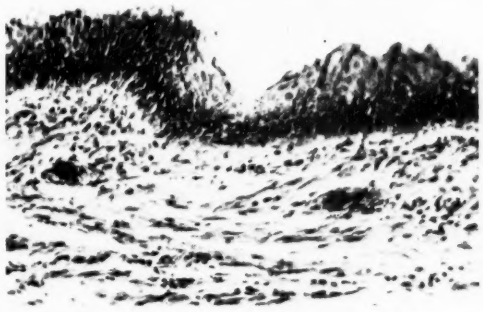

Fig. 8. Dog No. 369C. High power at *B′* of Figure 7, showing stratified squamous epithelium lying on a fibrous tissue base (×175).

The pathological specimen of the persistent fistulæ described strongly suggests incomplete drainage with continuous discharge of purulent material to be very important factors in the etiology of their persistency. This is substantiated alike by those fistulæ which tended to close spontaneously with the cessation of their discharge and by other fistulæ which persisted indefinitely, always presenting a discharge of purulent material. Another factor of etiological importance was brought out by the following observation: with the cessation of discharge from the bronchial fistula and the clearing of its infection, it was impossible to cause a reinfection by repeated injections of pathogenic organisms into or around the fistulous tract. However, with the introduction of a foreign body such as a piece of gauze into the passageway, reinfection

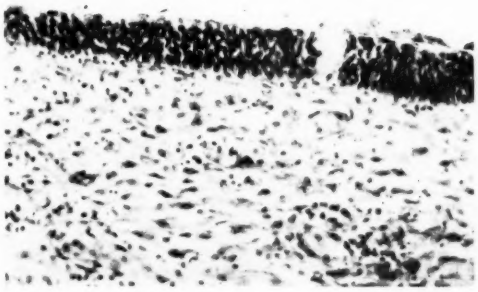

Fig. 9. Dog No. 369C. High power at *B* of Figure 7. Wall of persistent fistula showing stratified columnar epithelium lying on a fibrous tissue base (×175).

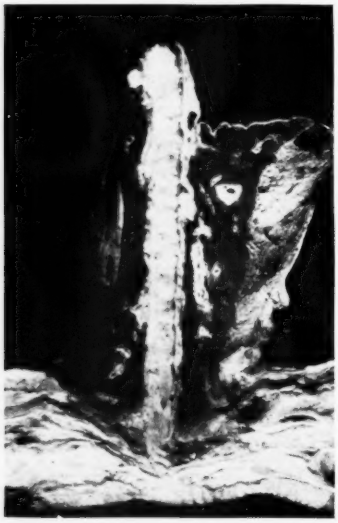

Fig. 10. Dog No. 172B. Photograph of a pathological specimen of a bronchial fistula 1 month following closure by 35 per cent silver nitrate. This fistula had persisted for 20.7 weeks and closed 2 weeks following one application of silver nitrate solution.

immediately followed and was associated with a discharge of pus. This demonstrates very clearly how delayed healing of a pathological sinus may be due to a foreign body lying in some obscure portion keeping the sinus infected.

In some recent studies on the treatment of pulmonary suppuration, repeated applications of a silver nitrate solution to the bronchus of

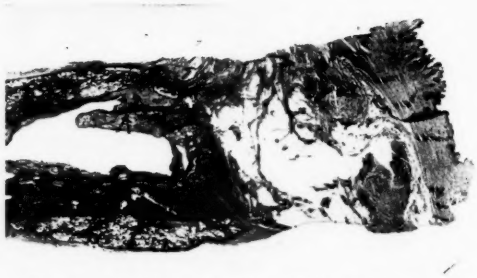

Fig. 11. Dog No. 213B. Microscopic appearance of a healed bronchial fistula 3 weeks following closure with 50 per cent silver nitrate solution. This fistula was of 10.1 weeks' duration when cauterized and closed 8 days following cauterization. Note polyp formation, *A* (×3).

a lobe containing a suppurative process failed to produce complete stenosis in the presence of a constant discharge of pus. Here was a condition comparable to a persistent fistula acting as a safety valve; e.g., a source of infection with only one exit for drainage. The failure of stenosis of this one exit may well be defined as a physiological process on the part of the animal to maintain an outlet for the purulent discharge. Contrasted to this was the prompt closure of persistent fistulæ from which pus was exuding. This closure of persistent fistulæ was very similar to the stenosis of a normal lung lobe bronchus which routinely followed an application of a silver nitrate solution (2).

Very large bronchial fistulæ occur occasionally, the proximal end of which may be seen through the bronchoscope. The possi-

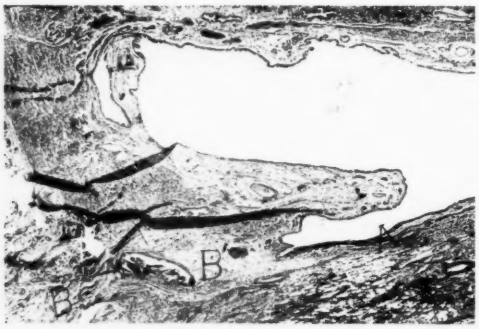

Fig. 12. Dog No. 213B. Location *A*, Figure 11. Showing blind end of fistula. Fibrous tissue at *B*, *B'* leads out to skin surface (×8).

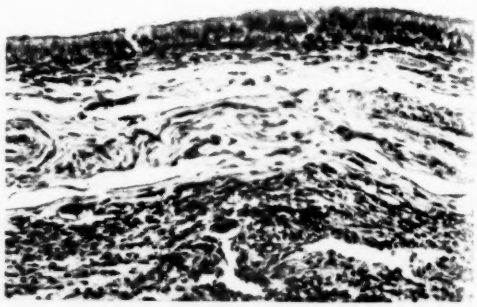

Fig. 13. Dog No. 213B. High power at *A* of Figure 1. Note stratified columnar epithelium lying on a fibrous tissue base.

bility of closing these fistulæ via the bronchoscopic route suggests itself when it is seen how readily complete stenosis of one of a dog's primary bronchi occurs following a single application of the cauterizing agent.

SUMMARY

1. Procedures for the experimental production of persistent bronchial fistulæ are described.

2. A method of closure of persistent bronchial fistulæ is presented.

3. Closure of a persistent bronchial fistulæ and stenosis of a normal bronchus of a lung lobe are compared.

4. Closure of the bronchus of the lung lobe containing a suppurative process and a bronchial fistula acting as a safety valve are compared.

5. Closure of a persistent fistula and of a bronchus of a lung lobe containing a suppurative process are contrasted.

We wish to thank Mr. Leo Hrdina for his suggestions and assistance in this experimental work.

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THE ASCHHEIM–ZONDEK PREGNANCY REACTION

Report Based on Two Thousand Controlled Aschheim-Zondek Pregnancy Tests

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From the Women's Clinic, University of Frankfurt a. Main, Professor L. Seitz, Director

SINCE the innovation of the Aschheim-Zondek reaction over 2 years ago, I have made several short reports concerning experiences in our clinic with it. At the present time (January, 1931), we have made more than 2,000 controlled Aschheim-Zondek tests; and without any knowledge of the clinical picture have secured a 98 to 99 per cent correct diagnosis in each instance.

It is, of course, true that, as in all other biological reactions, the results obtained depend largely on the experience and technique of the individual investigator. Though the technique of making the test itself is quite simple, there are nevertheless many details that must be mastered. I believe it goes without saying, therefore, that an investigator who has not the necessary experience, cannot obtain the best results. I have become thoroughly convinced from our experience that it is fairly easy to make mistakes in identifying reaction I and differentiating it from reactions II and III;[1] this is true especially if the investigator is not fully acquainted with the morphology and biology of infantile rodent ovaries. I am also convinced that sometimes the many so called inaccuracies are due not to the reaction itself but to the individual investigator. The clinician, therefore, should bear in mind that the value of the report on the Aschheim-Zondek reaction, depends to a great extent, as it does in the Wassermann reaction, on the ability of the investigator who makes the test.

MORTALITY OF THE TEST ANIMALS

The mortality in the test animals is fairly large; in my experience it was as high as 20 per cent and other authors have reported similar percentages. This high mortality is due in part to the toxicity of the urine and in part to the lack of resistance of the test animals. Recently Zondek has published a description of an ether detoxicating method (the urine is shaken thoroughly with two to four times its quantity of ether), which has reduced the mortality percentage in the test animals. For the past 4 months I have been using this detoxicating method in all urine hormonal tests in our clinic. Unfortunately, it is not possible thoroughly to detoxicate all urine by this method. This has been found to be especially true of the urine of pregnant animals, as has been demonstrated by Dr. Borenstein and myself.

At the end of the 100 hours, all the test animals may still be alive, but some of them may be in a somewhat weakened condition. It is thus evident that the mechanism of the hypophyseal hormone reaction will be somewhat disturbed in animals that are weakened physiologically. If, in these mice, autopsy reveals positive reactions (blood points and corpora lutea) then the results are quite reliable; on the other hand, if autopsy yields negative or positive results for reaction I, the results must be cautiously interpreted. To be reliable the test should be based upon the results found in undamaged, healthy test animals.

SELECTION AND NUMBER OF TEST ANIMALS

The Aschheim-Zondek reaction is a biological one, in that the test object is the ovary of the infantile mouse. Thus, the test object is subjected to all the variations of life. If we use in each reaction 5 infantile mice, or in other words 10 infantile ovaries, it gives us 10 biological test objects to work with. In this way, it is possible to reduce the source of error to a minimum of 1 to 2 per cent.

The claims for accuracy in the Aschheim-Zondek reaction cannot be fulfilled in an ideal way, if instead of 5 mice only 3 or even 4 are used. Such technique can in no way be approved of, for unless properly done the reaction may be brought into ill repute. Test animals may possibly be spared not at the beginning but at the end of the test, but only in selected cases, namely, when the reaction is positive. If but 1 blood point or but 1 corpus luteum makes its appearance, the test is indicative of pregnancy. This finding at autopsy in even one animal makes the diagnosis indisputably clear. For the past year, I have not killed all 5 animals at one time, but have examined but one animal at a time. If the results in the first are clearly positive, then it is not necessary to sacrifice the 4 other animals. It goes without saying that if the reaction is negative or in doubt each animal must be examined.

[1] Reaction I—enlargement of uterus and estrus production.
Reaction II—hæmorrhagic follicles (blood points). } Indicate
Reaction III—formation of corpora lutea. } pregnancy.

HYDATIDIFORM MOLE AND THE PREGNANCY REACTION

Every gynecologist knows how often it is difficult to diagnose hydatidiform mole; often the clinical picture distinctly points to hydatidiform mole and yet absolutely definite proof is lacking. It is important to know, therefore, that, in the course of the last year a noteworthy addition has been made to our knowledge of the symptomatology of hydatidiform mole. For quite some time, in addition to the known clinical symptoms, there has been noted an extraordinarily characteristic, biological symptom, namely, the abnormal high concentration of the anterior hypophyseal hormone in the urine and blood. From the investigations of Aschheim, Zondek, Robert Myer, Roessler, Fels, Philipp, and myself, we know that the urine of a patient with a hydatidiform mole contains very large quantities of anterior hypophyseal hormone and that a very minute amount of urine will give a positive Aschheim-Zondek pregnancy reaction. We are, therefore, in a position to establish a definite diagnosis of hydatidiform mole in doubtful cases by a quantitative urine analysis. I have cited two such cases; in the first patient, the reaction was positive with 1/520 cubic centimeter of urine, and in the second, with 1/260 cubic centimeter. At the present time I am following another case of hydatidiform mole in our clinic, in which it has been possible to corroborate the suspected clinical diagnosis by the huge hormonal content of the urine. It is also noteworthy that in this case, the liquor amnii also gave positive reactions II and III. We have made it a rule carefully to follow and treat all patients with hydatidiform mole until the hypophyseal hormonal reaction I becomes negative.

CHORIO-EPITHELIOMA AND THE PREGNANCY REACTION

In the contributions of Aschheim, Zondek, Roessler, Fels, Hirsch-Hoffmann, Robert Myer, and myself, details are given concerning the results produced by a chorio-epithelioma in the Aschheim-Zondek reaction. We know that, in the majority of the cases, the blood and urine of a patient with chorio-epithelioma gives a positive pregnancy reaction. In many cases, as in the hydatidiform mole, the hormonal content of the hypophyseal hormone is abnormally high. In a case of chorio-epithelioma of the kidneys, Robert Myer demonstrated 70 mouse units of hormone per cubic centimeter of urine; likewise, in a case of testicular chorio-epithelioma, Fels showed the presence of 33 mouse units per cubic centimeter of urine. I also reported a case of primary chorio-epithelioma of the uterus, which gave in a quantitative urine analysis, 100 mouse units per cubic centimeter of urine. The case just referred to deserves special notice, in that it illustrates that on suspicion of chorio-epithelioma an exact diagnosis can be obtained by a hormonal analysis of the urine. Thus, in the future, in all cases that clinically are suspicious of chorio-epithelioma, an exact hormonal quantitative analysis should be made; in this way doubtful clinical diagnoses can be checked up as early as possible. In the follow-up management of these cases, the anterior pituitary reaction, after a few weeks or months is negative, just as it is in hydatidiform mole. In cases that take a malignant course, the reaction remains positive and such cases of course must be given proper treatment. In any case the patient must be kept under observation until the reaction is definitely negative. It is of value to examine the urine at regular intervals so that if there is any possible recurrence it may be recognized as early as possible.

AN ARTIFICIAL PREGNANCY REACTION IN THE NON-PREGNANT WOMAN

I have previously reported at length concerning the behavior of the anterior lobe hormone of the hypophysis in the non-pregnant woman. In my investigations I transfused the blood of pregnant women into non-pregnant anæmic women. I examined the blood and urine hormonal content of the latter and found:

1. After a transfusion of 500 to 700 cubic centimeters of pregnant blood (1,500 to 7,000 mouse units of anterior hypophyseal hormone), I was able to demonstrate reactions II and III in the blood stream from 2 to 20 hours after the transfusion. Soon after this, the blood gave only a positive reaction I and still later the reaction was entirely negative. These results seem to show that the body has the power and the ability to eliminate in a fairly rapid manner large quantities of hypophyseal hormone from the blood stream.

2. As to the fate of the remainder of the hormone, a urine analysis demonstrated the following: urine secreted in the first 24 hours gave positive reactions II and III; in other words, the sudden loading of the blood stream with extraneous hormone, was excreted at least in its greatest part, in the first 24 hours in the urine.

3. Through investigations of successive single urine analyses, I found that the excretion of the hormone in the urine appears as early as 10 minutes after the beginning of the transfusion, and continues for from 12 to 24 hours.

4. These results bear some important relation to the question of dosage; they show that it is not possible by our therapeutic procedures to work with large quantities of hypophyseal hormone; an extra load will be excreted in the urine. For this reason, it would seem that the repeated administrations of small doses of hypophyseal hormone would be more practicable and physiological.

5. The investigations described show that the organism of the non-pregnant woman reacts to the hypophyseal hormone largely in the same way as the body of the pregnant woman reacts, for, a flooding of the blood stream with large quantities of hypophyseal hormone in the non-pregnant just as in the pregnant woman produces a positive, even though transient, Aschheim-Zondek pregnancy reaction.

Further clinical investigations (not as yet published) have also demonstrated that after the intravenous administration of large quantities of hypophyseal hormone, a positive reaction II and III is obtained in the urine.

THE CLINICAL SIGNIFICANCE OF REACTION I

It is well known, that Aschheim and Zondek have grouped the actions of the anterior lobe hormone into 3 phases: reactions I, II, and III, as explained above.

Reaction I is not significant in the diagnosis of pregnancy, for it may occur in the presence of slow as well as rapidly proliferating tumors (myoma, carcinoma), in the presence of diminishing genital function at the beginning of the menopause, and in certain types of amenorrhœa. Two years ago, I reported a case of a 35 year old woman, with a high degree of genital hypoplasia; her urine and blood gave a positive reaction I over a period of 10 months. In cases of this sort, it is apparent that reaction I indicates a hyperfunction of the anterior hypophysis with subsequent overproduction of the hypophyseal hormone. This theory is supported by the parabiotic investigations of Matsuyama.

For the diagnosis of carcinoma, at the present time at least, reaction I has no real worth, since it is positive in a good many cases of benign tumors; however, it is not improbable that in the near future, with the further development and refinement of technique, it may be more definitely significant in the diagnosis of early malignancy of the female genital tract.

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CLINICAL SURGERY

FROM THE CINCINNATI COLLEGE OF MEDICINE

THE SURGICAL APPROACH AND THE TREATMENT OF TUMORS AND OTHER LESIONS ABOUT THE OPTIC CHIASM

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THE purpose of this review is to trace the evolution of the operative approach to lesions about the optic chiasm, to note the advances which have been made in our knowledge of the many lesions in this region which may cause optic atrophy and visual disturbances, and to comment upon our present conceptions of the treatment and the results of treatment of these lesions. While very restricted in its dimensions, the region about the optic chiasm is the starting point of a variety of tumors and other conditions, the number of which certainly equals if it does not surpass any other single region of the brain. Moreover, the clinical manifestations of these conditions are of such variety that they concern the physician, ophthalmologist, neurologist, endocrinologist, rhinologist, roentgenologist, and surgeon. As a result the literature on the subject is widely scattered and unfamiliar to the majority; for we find that while the diagnosis of primary hypophyseal tumors is usually made, the more recently discovered conditions about the optic chiasm which also cause optic atrophy and visual disturbances are but little understood.

As so often happens in medicine the discovery and adoption of a new method is immediately followed by a great advance in our knowledge of a subject. The intracranial approach to the chiasmal region is certainly not a new method but its adoption in any general sense has been long delayed. Coincident with its more general use in recent years has come a great increase in our knowledge of the pathology, clinical manifestations, and diagnosis of a variety of conditions about the optic chiasm which as urgently demand treatment as the primary hypophyseal tumors. Its very importance in the development of our knowledge of the subject is my reason for first considering the evolution of the various operations which from time to time have been suggested and used in the exposure of the chiasmal region. I may perhaps best discuss them under intracranial and extracranial operations, the prototype of the former being the now commonly used transfrontal approach, that of the latter being the well known transphenoidal approach.

INTRACRANIAL OPERATIONS

The temporal or subtemporal approach. The intracranial approach to hypophyseal tumors antedated the transphenoidal and the first to be suggested was by the temporal or subtemporal route.

Caton and Paul, in 1893, acting on Horsley's suggestion, attempted to approach the hypophysis by a lateral subtemporal route. The idea was to elevate the temporal lobe sufficiently to expose the chiasmal region (Fig. 1). The operation was not completed, the patient dying before the second stage was undertaken. Horsley himself is said consistently to have followed this route to the chiasmal region; and while his own statements regarding the matter are meager, Cope states that Horsley operated upon one case of hypophyseal tumor as early as April, 1904, and had done 10 hypophyseal operations with 2 deaths by 1906. Casselli, Paulesco, and Cushing used this approach in hypophysectomies in experimental animals, and it has remained the approach of choice in experimental work. Casselli, probably as a result of his experimental work, also suggested its use in the approach to the hypophysis in man but I have been unable to discover that he successfully carried it out. Cushing (15) attempted it in 6 cases but in only 1 was he able to expose the chiasmal region and partially remove a tumor. Dahlgren is stated to have approached the hypophysis through the middle fossa after opening the dura and retracting the temporal lobe.

Frontal approach. So far as I can gather Krause (60) was the first to suggest a transfrontal approach.

At a meeting of the Berlin Medical Association, October 24, 1900, Krause demonstrated a cadaver preparation showing his method of approach. It consisted in the formation and elevation of an

Fig. 1. The subtemporal approach of Caton and Paul. (Brit. M. J., 1893, ii, 1421.)

osteoplastic flap 5.5 centimeters in transverse and vertical diameters above the supra-orbital ridge, the extradural elevation of the frontal lobe to the lesser wing of the sphenoid, the incision of the dura at this point, and the exposure of the optic nerves, the chiasm, and hypophysis through this dural opening. At this time he had not used it upon the living subject, but subsequently he removed a tumor of the base by this approach. Borchardt, in 1908, attempted to expose an hypophyseal tumor by this method but failed to complete the operation. In the second stage of a two-stage procedure he encountered such dangerous hæmorrhage that he abandoned the operation before the hypophysis was exposed. He then did a successful partial extirpation according to the method of Schloffer. In his original communication Krause states that an oblique frontal approach is better than a direct frontal approach; and later he modified his operation by reflecting a large dural flap, thereby converting an extradural approach into an intradural approach. By this method he successfully exposed and removed an hypophyseal tumor (1909). While Krause himself seems to have performed but few operations for hypophyseal tumor, his operation has served as a model for almost all subsequent frontal operations.

Kiliani, in 1904, proposed a very radical procedure which contemplated the formation and reflection upward of a large Wagner flap including both frontal bones; and the reflection of an equally large dural flap which necessitated the ligation of the longitudinal sinus. The frontal lobes were elevated and the chiasm approached from within the dura (Fig. 2). The operation was suggested because of the author's conviction that any extradural approach was without value in the exposure of the chiasmal region. Kiliani's operation was, then, one of the first transfrontal intradural approaches suggested. I cannot find that it was ever used in the approach to an hypophyseal tumor in a living subject.

Bogojawlensky, in 1911, reported an operation by means of which he had successfully exposed and removed an hypophyseal tumor. The operation was Krause's later intradural approach, the only modifications being an "H" shaped incision in the dura so that a dural flap was reflected upward and downward, and the use of the overhanging position of the head. The exposure was sufficient to enable the operator to see the relations of the tumor to the optic nerves and chiasm. His patient recovered and the case is one of the three first successful tumor extirpations by the transfrontal approach.

McArthur, in 1912, described a frontal approach which differs from any of the preceding. A cutaneous periosteal flap is reflected over the frontal bone. The frontal bone including the supra-orbital ridge and anterior half of the orbital plate is completely removed and placed in salt solution, and the posterior part of the orbital plate back to the optic foramen is rongeured away. The frontal lobe is elevated, the orbital contents depressed, and the region of the anterior clinoid processes approached extradurally. At a point between the anterior clinoid processes an incision 2 to 3 centimeters in length is made in the dura and the chiasmal region is exposed. At the termination of the operation the frontal bone is replaced as a free transplant (Figs. 3, 4, 5, 6, and 7). McArthur records 3 cases operated upon by this method.

Frazier (32), in 1913, proposed a transfrontal approach which was a modification of McArthur's method. An osteoplastic flap over the frontal region is reflected lateralward. The supra-orbital ridge is exposed and removed as a separate fragment and subsequently replaced as a free transplant. The frontal lobe with its dural covering is elevated, the orbital contents depressed, and the chiasmal region approached extradurally. Upon exposure of the region of the sella, the dura is incised horizontally and sufficiently widely to admit the blade of the elevating retractor. The optic nerves and chiasm are then brought into view. Frazier (33) subsequently (1919) modified his operation changing it from an extradural to an intradural approach. In his later operation the resection of the supra-orbital ridge remains the same but he has abandoned the removal of the orbital plate. The dura is opened widely in a line concentric with the frontal bone flap; and from the orbital border of this incision a counter incision is carried downward and backward toward the sella (Figs. 8, 9, 10, and 11). The author states that the exposure is greater and more easily obtained than in his original extradural approach. More recently (1928) he (34) suggests the approach to the chiasm at an angle, i.e., along the greater wing of the sphenoid rather than directly from in front, because in the latter he has observed a remarkable fall in blood pressure which has been absent in the former. He suggests also a bilateral frontal approach 3 months apart in some of the larger tumors because of his inability properly to explore the portion of the tumor on the side opposite

his primary approach. Still more recently (1930—personal communication) he states that he has again modified his operation. The scalp flap is reflected forward so as to eliminate one of the skin incisions in the forehead. A rather small bone flap, fashioned above the frontal sinus, is reflected toward the temporal region. The supra-orbital ridge is not resected as in his earlier procedure. An incision is made in the dura parallel with the anterior margin of the bone flap and the frontal lobe is elevated within the dura. The approach to the chiasm is from the side, along the greater wing of the sphenoid. In Frazier's hands, therefore, the operation has developed into a lateral intradural approach.

Since Frazier's contributions there have not been any noteworthy additions to the frontal approach. Such additions as have been made are of the nature of modifications of his method. Cushing (15) makes use of a transfrontal extradural approach, i.e., the earlier approach of Frazier, but without the resection of the supra-orbital ridge (Figs. 12, 13, 14, 15). Elsberg includes a part of the supra-orbital ridge in the bone flap instead of removing it as a separate piece and reflects the flap mesially instead of laterally. Kanavel (51), Fleming, Horrax, Penfield, and Grant prefer the transfrontal extradural approach; Loyal Davis, Keegan, and Rand a transfrontal intradural approach. Naffziger has made a modification in that he reflects the scalp flap separately and turns it forward and downward so as to eliminate the supra-orbital skin incision. Otherwise, it is an extradural approach. McKenzie after the reflection of a frontal osteoplastic flap makes a long incision in the dura over the convex surface of the frontal lobe so as to permit the dislocation of the frontal lobe through this opening during its elevation. He terminates the operation with a small subtemporal decompression so as to allow for postoperative cerebral œdema. The approach to the chiasm is extradural. Among British surgeons, Sargent uses a transfrontal approach similar to that of Frazier. The few reports from continental surgeons fail to show any noteworthy contributions.

Lateral frontal approach. Under frontal approaches it was stated that Krause was the first to suggest a transfrontal extradural approach; and that he later substituted for this procedure a frontal intradural approach.

Krause suggested in his early publication that an oblique approach to the chiasm is preferable to a directly anterior approach. Krause (61) seems also to have used a lateral frontal intradural approach to the hypophyseal region for such an operation is clearly illustrated in his textbook of surgical operations. I have been unable to find any reference to this operation in the literature and do not know when it was used. As pictured it consisted in the reflection of a large osteoplastic flap over the frontoparietal region with the wide opening of the dura. The hypophyseal region was approached from the side rather than from directly in front (Figs. 16 and 17). Certainly one case with signs of acromegaly was successfully operated upon by this method and was quite well 4 years after operation.

Silbermark, in 1910, operated upon 50 dogs by an intracranial approach without a single death from infection. Believing that an intracranial approach to the hypophysis was desirable from the standpoint of greater exposure and diminished danger of infection, he undertook to perfect an intracranial approach in man. His operation which, so far as I am aware, was performed only on the cadaver consists in the formation of a bilateral osteoplastic flap, one over either hemisphere with the opening of the dura on either side by a crucial incision. The head is placed in the overhanging position; the frontal lobe on the side of the approach is gently elevated with a spatula and the chiasmal region is exposed. While, as we now know, the operation is unnecessarily radical it includes an important principle, i.e., that of cerebral dislocation, of which we constantly make use and which is obtained both by the overhanging position of the head and the contralateral cranial opening. Dandy (23), in 1918, recorded a lateral frontal intradural approach to the chiasmal region which I had devised in 1914 but had not reported. Dandy's object was, of course, to put the operation on record during my absence in France.

Adson, also in 1918, described a lateral frontal intradural approach. An osteoplastic flap with its pedicle below is reflected downward from the temporoparietal region and the dura is opened widely. The frontal and temporal lobes are protected with rubber tissue, the base of the frontal lobe is carefully elevated from the side, and the elevation is continued until the optic nerves and chiasm come into view. If the hypophyseal tumor presents anteriorly between the optic nerves it is freed, encircled by a tonsil snare, and removed.

Heuer, in 1920, gave a more detailed account of the operation described by Dandy in 1918. A large osteoplastic flap is reflected downward from the frontotemporoparietal region and a dural flap of almost equal size is reflected posteriorly. The base of the frontal lobe is carefully elevated until the optic nerves and chiasm are brought into view. The temporal lobe is often retracted posteriorly to increase the exposure (Figs. 18, 19, 20). The approach is therefore a lateral intradural approach and in all respects resembles the operation of Adson excepting that the bone flap is larger. The purpose of a large flap is to allow for cerebral dislocation. The overhanging position of the head combined with ventricular puncture still further increases the ease and extent of the exposure. More recently a small subtemporal decompression has often been added to the procedure in order to take care of the possible postoperative cerebral œdema. This operation has now been used by him in 40 consecutive cases of hypophyseal, chiasmal, and suprasellar tumor.

Bakulew, in 1926, in a discussion of the value of various approaches to the chiasmal region states

that the frontal extradural approaches of Krause, McArthur, and Frazier fail to give sufficient exposure; and that Adson's parietotemporal approach is fairly satisfactory in dolichocephalic but difficult in brachiocephalic heads. He states further that it is attended with the possibility of injury to important vessels in the approach to the sella and gives only a limited exposure of the chiasmal region. Because of these objections to the extradural and Adson's intradural approaches he suggests the reflection of a large frontoparietotemporal osteoplastic flap, the reflection of an equally large dural flap, and the intradural approach to the chiasm from the side. He does not give any illustrations of his procedure but from his description his operation resembles exactly that which I described in 1920. He thinks that this operation secures a wider exposure than others with which he is familiar and reports several cases operated upon by this method. His report is the only one I have been able to find since 1920 which is concerned with the lateral frontal intradural approach.

EXTRACRANIAL OPERATIONS

The purpose of all extracranial operations has been to approach the floor of the sella turcica through the sphenoidal sinus. They may be roughly grouped into nasal and buccal operations, the former of which may again be divided into superior nasal (Giordano, Schloffer, Eiselsberg, Kocher, Kocher, etc.) and inferior nasal (Kanavel, Halstead, Hirsch, etc.).

The nasal transphenoidal operations. Giordano, in 1897, proposed a transphenoidal approach which involved the osteoplastic resection of the anterior wall of the frontal sinus and nose. The operation was improved upon by Schloffer who, in March, 1907, was the first to perform a successful partial tumor removal. His operation consisted in the reflection of the nose to the right and the excision of the turbinates, the mid-septum, the wall of the orbit and maxillary sinus, the left nasal process of the superior maxilla, and the ethmoid cells. The floor of the sella was removed and the adenomatous tumor partially removed. Moszkowicz, a little later in the same year, suggested a modification of Schloffer's operation in which the nose was reflected to the side and the septum and the ethmoid cells removed. The inner walls of the orbit and maxillary sinus were left intact. Sufficient exposure was obtained by the removal of the anterior and lower wall of the anterior cranial fossa and a part of the frontal process of the superior maxilla. The operation was divided into two stages. After the sphenoidal sinus was opened and exposed, a pedunculated skin flap from the forehead was turned back into the operative wound, the end of which was introduced into the sphenoidal sinus. At a second sitting the floor of the sella was entered and the tumor removed. The top of the skin flap previously turned back into the operative opening was now used to tamponade the sella turcica. The idea of the skin flap was to lessen the risk of meningitis. Loewe (66), in 1908, reported a superior nasal approach which, with very slight modifications, was the same as that used by Schloffer and later by Eiselsberg; but the author suggests that Schloffer's and Eiselsberg's operations were modifications of the operation practiced by him upon the cadaver. Hochenegg simplified Schloffer's operation, removing only the nasal septum and the turbinates; and in 1909 reported 3 cases operated upon by his modification. Eiselsberg's (28) modification (1908) of Schloffer's operation was also less extensive. A tuning-fork incision consisting of a vertical incision in the mid-forehead continued into two incisions, one along either side of the nose, was followed by the reflection of the nose downward, the temporary resection of the frontal sinus, and the exenteration of the nasal cavity. Later (1910) he (29) considerably modified the method in favor of one in which the nose is deflected to the side (Figs. 21, 22). Kocher, in 1909, simplified the intranasal part of the operation still more. Through a skin incision "T" shaped above and inverted "Y" shaped below (Fig. 23) a submucous resection of the septum was done, followed by the division of the nasal bone in the midline, and the reflection to either side of an osteocutaneous flap comprising over half the nose. The mucous membrane of the septum was displaced laterally and a specially devised speculum was introduced into the nasal cavity, the opening of which crowded the mucous membrane and the turbinates to either side. An operative approach was thus obtained to the floor of the sella turcica. Kocher reports a case operated upon by this method in which he successfully performed a fragmentary removal of an hypophyseal tumor.

Among the more radical superior nasal approaches was that of Nowikoff who in 1913 proposed the temporary resection of the upper jaw and nose (Fig. 24). The turning outward of the nose and superior maxilla gives a wide approach to the base of the skull and the sphenoidal sinus is easily recognized and opened. The operation, so far as I can determine, was performed only on the cadaver. Among the lesser superior approaches is that of O. Chiari (1912) more recently described and used by Oehlecker (1922). It consisted of a short, curved skin incision around the inner border of the orbit with resection of the ethmoid; in other words a transethmoidalsphenoidal approach (Fig. 25), Oehlecker reports 6 cases operated upon successfully by this method.

The subsequent modifications of the procedures mentioned—all superior nasal approaches—were in the direction of converting them into inferior nasal approaches.

Kanavel (52), in 1909, demonstrated upon the cadaver the possibility of approaching the sella turcica through the inferior nares. The nose was

turned upward by an external curved incision through the nasolabial junction of the face and an entrance was made into the inferior part of the nasal cavity. The nasal septum was cut along its inferior part and its attachment to the perpendicular plate of the ethmoid. The middle turbinates were removed and the septum deflected to one side. The sphenoidal foramina were located and the interfering attachment of the perpendicular plate of the ethmoid and the vomer were bitten away. The anterior wall of the sphenoid cells was broken into and the floor of the sella was removed. In the approach, a Fraenkel nasal speculum was used to hold the deflected septum to one side, and the operative manipulations within the sphenoidal sinus were carried out through the speculum. Sufficient illumination was obtained with a headlight. The following year Kanavel (53) reported a case successfully operated upon by the method, as did Mixter. In 1913, Kanavel (54) reported 3 cases operated upon by his approach and reviewed the cases of hypophyseal tumor operated upon by the nasal route reported in the literature. In 1918, Kanavel (55) reported the late results in his cases and gave some excellent drawings to show his approach (Figs. 26, 27, 28, 29).

In the same year (1909) Hirsch (41) suggested an endonasal route done in two or three stages under local anæsthesia. The operation consisted in the resection of the median septum and the subsequent opening of the sphenoid through a single nostril, after the method of Hajek. In 1910, Hirsch (42) reported a case operated upon successfully by this method. As a result of his experiences with this case he (43) suggested (1911) a median approach with resection of the septum as being better than a lateral approach through one nostril; and he reports 11 cases operated upon by this method. In 1912, Hirsch (44) was able to report 26 cases and in 1926 (47), 100 cases operated upon by his endonasal approach. West suggested a similar procedure at about the same time.

In 1910, A. E. Halstead (38), impressed by the advantages of Kanavel's infranasal route adopted it in his first operative case but modified it by using a sublabial instead of an infranasal incision. After a preliminary tracheotomy the upper lip was raised and an incision was made in the mucous membrane over and parallel with the alveolar process just below the labial frenum. The soft tissues were freed from the underlying bone and the nose was gradually drawn upward with retractors. The septum was divided with bone forceps and displaced upward and laterally. The turbinates, vomer, and perpendicular plate of the ethmoid were removed. The anterior wall of the sphenoidal sinus was opened and there presented in the sphenoidal sinus a bluish pulsating tumor. This was partially removed. A second case was operated upon by the same method.

Cushing (15), in 1912, after using Hochenegg's and Eiselsberg's modification of Schloffer's operation evolved an approach which was a modification of the methods of Kanavel, Halstead, and Hirsch. The upper lip was drawn up and an incision was made across the labial frenum according to the method of Halstead. The incision was carried down to the anterior nasal spine of the superior maxilla and by blunt dissection the soft parts were separated from the lower margin of the bony nasal opening until the cartilaginous septum was exposed. The mucosa was elevated from the bony and cartilaginous septum. With a retractor holding the mucous membrane to either side, the septum was removed together with most of the vomer and part of the median plate of the ethmoid, and occasionally the anterior spine of the maxilla. With the original retractors in place a series of dilating plugs were introduced between them, the object of which was to flatten the turbinates to one side. A bivalve speculum was then introduced to replace the retractors and, working through this with the aid of a headlight, the sphenoidal sinuses were identified, the sphenoidal cells were opened with nasal rongeurs, and the lining mucous membrane was removed. The protruding floor of the sella was then identified, perforated, and removed with rongeurs. The capsule of the hypophysis was opened and the cystic contents were evacuated or the tumor tissue removed. A recent personal communication states that Cushing has performed 280 transphenoidal operations according to this method; undoubtedly, the largest single series by any method (Figs. 30, 31, 32, 33, 34).

There have not been any further important contributions to this operative approach. The literature on the subject is very large and numerous slight modifications from time to time have been suggested. To detail them would be to prolong unduly this part of our discussion without making any noteworthy contributions to it. Essentially they are all inferior nasal approaches.

The buccal transphenoidal operations. As is the case in many of the operations just described, the buccal transphenoidal operations have now only an historical interest.

Koenig, in 1900, after an investigation of 2 years on the cadaver reported a transpalatal approach to the hypophysis. The operation consisted in the division of the soft palate in the midline, the reflection of the mucosa and periosteum from the hard palate, and the resection of the hard palate according to the method of Gussenbauer. The entrance into the nasal cavity thus obtained was followed by the removal of the nasal septum and vomer and the exposure of the hypophysis through the sphenoid. I cannot find that Koenig practiced this operation upon the living subject; but Stewart and Ballance successfully exposed any hypophyseal tumor by this route; and Durant and Preysing are said to have used it. As late as 1913 Broeckaert favored this approach. Loewe (67), in 1909, described his method which also consisted of an ap-

proach through the palate but, according to the method of Partsch instead of according to that of Gussenbauer. Krogius, in 1909, also suggested a transpalatal approach after dividing the lower jaw in the midline. Biehl, in 1912, proposed as a preliminary step, in the transpalatal approach, a suprahyoid pharyngotomy. At the time of his report he had practiced this approach only on the cadaver.

Such, in résumé, are perhaps the most important of the many surgical approaches to the chiasmal region. Their evolution forms an interesting chapter in the history of operative surgery. While the intracranial approach was the first in the field, neither the operations of Caton and Paul, of Krause, of Kiliani, or of Bogojawlensky proved successful in the hands of surgeons untrained in neurologic surgery. Only Horsley, who was so trained, achieved any measure of success; and his record of 10 operative cases with 2 deaths remained for a long time unapproached. For the rest the intracranial approach was attended either by failure to expose the lesion, by massive hæmorrhage, or by severe injury to the brain; with a resultant mortality which was in the neighborhood of 70 to 80 per cent. When Schloffer, in 1907, reported the first successful partial tumor removal by a transphenoidal approach it was natural that surgeons should adopt this method; for while technically the transphenoidal operation is not always easy it is inherently safer from the standpoints of hæmorrhage and brain injury and may more readily be performed without special knowledge of, or training in, neurosurgery. The transphenoidal operation promptly became the operation of choice for hypophyseal tumors and through the modifications of various surgeons already mentioned evolved into the highly perfected, inferior nasal, sublabial approach that we know today. Within 5 years after Schloffer reported his successful case, Hirsch (45) was able to collect 148 operations for hypophyseal tumor, 126 of which had been done by the transphenoidal route; and Frazier (32) about the same time found 74 cases of hypophyseal tumor verified by operation or autopsy, 64 of which had been operated upon by the transphenoidal route. In the same period, if we exclude the unreported cases of Horsley, only 3 cases of hypophyseal tumor had been successfully operated upon by an intracranial route. With the passing years, the number of patients operated upon by the transphenoidal method steadily mounted until in 1926 Hirsch (47) alone could report 100 cases, and in 1929 Cushing (14) alone could report 280 cases.

The disadvantages of the transphenoidal route rather quickly became known. It was not an aseptic approach and when tabulation of cases first began to appear in the literature the mortality from meningitis alone was in some instances as high as 25 per cent. It was realized that the approach was very restricted and quite failed to expose the lesion it was intended to expose; it altogether failed to give the operator any idea of the intracranial extent of the lesion attacked; it was wholly inadequate in the approach to lesions above the chiasm (suprasellar); and the results obtained by the operation were unsatisfactory and temporary. The mortality in the earlier series of cases reported (Schnoor, 148 cases by various transphenoidal methods) varied between 13 and 38 per cent; with an average mortality of 25 per cent. In spite of its disadvantages it continued to be the operation, par excellence, for hypophyseal tumors; and there were surgeons who stated in the literature that it would always remain the operation of choice for primary pituitary lesions. Indeed, it probably was the operation of choice until 1926 and after; but since that time has been largely superseded by other methods. The probable reasons for its decline will shortly be stated.

Meanwhile, the intracranial approach received little support; and it was not until 1912 that some interest in it was revived by the publication of McArthur's frontal approach. McArthur, like many others, was impressed by the disadvantages of the transphenoidal approach and his operation was designed to overcome them; and the fact that he was able to expose an hypophyseal tumor in each of 3 cases by his approach did something toward dispelling the idea that the chiasmal region was unapproachable by the intracranial route. Moreover, the need of an intracranial approach was becoming better appreciated; for it was beginning to be recognized that the suprasellar tumors, meaning by that term lesions lying above the chiasm, could not be dealt with satisfactorily by the transphenoidal approach. Frazier, in 1913, modified and simplified McArthur's approach; and his repeated modifications of his own method have resulted in a comparatively simple transfrontal intracranial approach which has stood the test of experience and has survived to the present day. Perhaps no other single surgeon has done so much to popularize the intracranial approach; for Frazier in his many publications on the subject has established the important facts that aside from its advantages as an aseptic approach, actual experience with the two methods shows that the intracranial

approach better exposes the lesion it is intended to attack; that the results obtained are more promising; and that the mortality is as low or lower than that of the transphenoidal approach. By 1916, surgical ideas regarding the approach to hypophyseal tumors had crystallized to such an extent that all the operative approaches to the chiasmal region here described had largely been abandoned excepting two—the transfrontal intracranial approach of Frazier and the inferior, sublabial, transphenoidal approach as developed by Kanavel, Halstead, Hirsch, and Cushing. Of these the weight of opinion was all in favor of the transphenoidal approach; for it had the support among others of Eiselsberg, Kanavel, Hirsch, and Cushing, whose combined experience and clinical material far exceeded that of others interested in this field. However, with the continued advocacy of other intracranial procedures by Dandy, Adson, and others there began about 1920 a trend in favor of the intracranial approach which has continued to the present time. Today the weight of surgical opinion is wholly in favor of the intracranial approach to lesions about the chiasm. In an attempt to discover more accurately the present opinion among neurologic surgeons I have addressed a questionnaire to the 31 members of the Society of Neurologic Surgeons and to others whom I know are interested in neurologic surgery. Of the 21 surgeons who were kind enough to reply to my questionnaire, two for various reasons failed to express a definite opinion as to a choice of operative approach. Of the 19 who expressed a positive opinion, 15 are unreservedly in favor of the intracranial approach to lesions about the optic chiasm including hypophyseal tumors. This of itself is significant as indicating the recent trend in this field of surgery; but it is also interesting that no surgeons,[1] who primarily or after experience with both methods advocated the intracranial approach, have ever adopted or gone back to the transphenoidal approach; while, with only one or two exceptions, those who have been instrumental in the development of the transphenoidal approach and who for years have advocated this method have finally abandoned it in favor of the intracranial approach. The change in attitude in some instances has been sudden; for we find that authors who strongly advocated the transphenoidal approach 4 years ago now declare it to be obsolete. Of the 4 neurologic surgeons who were not unreservedly in favor of the intracranial approach, 3 favor the transphenoidal approach for hypophyseal tumors eroding the base of the sella and the clinoid processes, the transfrontal approach for suprasellar tumors, or for the larger intrasellar tumors, or for those primary intrasellar growths which have recurred after a transphenoidal approach; and 1 favors the transphenoidal approach for pituitary tumors with acromegaly, the transfrontal for all other lesions. From foreign literature, if I have interpreted it correctly, there has been a similar trend toward the intracranial route. The notable exceptions are Hirsch (47) whose latest report appeared in 1926 and Krause (62) (1927) who, although the first to suggest the transfrontal approach, has adopted the Schloffer operation as the operation of choice.

It is interesting to try to trace the reasons for this change in attitude. I noted in preceding pages that the intracranial approach when first attempted was attended by a mortality of 70 to 80 per cent and that one reason for this prohibitive mortality was the unfamiliarity of surgeons with intracranial procedures. The mortality, however, was really no greater than that following attempts to remove brain tumors generally when the attempts were made by surgeons untrained in neurologic surgery. Under these circumstances the transphenoidal approach promised and did actually show far better mortality results even though it carried the real danger of meningitis. With the development of neurologic surgery as a more or less special field of surgery and with the training of surgeons in this special field the mortality attending all operations upon the brain declined as it did in operations for hypophyseal tumors. In 1916, Cope collected the cases of pituitary tumor operated upon by various methods and found that the mortality following the transphenoidal approach was 9 per cent, that following the intracranial method (fronto-orbital) was 8.6 per cent. In 1919, Frazier (33) added 8 cases without a death reducing the mortality of the intracranial approach to 6.4 per cent. By 1920, then, the mortality attending the transphenoidal and intracranial approaches was practically the same. In our report of 1920 we had to confess to a much higher mortality (37 per cent) following a lateral intradural intracranial route. Before the report was published, however, we had proved to ourselves that our mortality was due not to the method of approach but to the attempt to deal too radically with the lesions exposed; and our mortality since 1920 (6.6 per cent) would tend to bear out this statement. At the present time the mortality generally throughout the country in the hands of neurologic surgeons may be gathered from the report of 14 neurologic surgeons who are willing to submit their figures.

[1] Krause apparently is an exception.

In 351 cases operated upon by 7 surgeons by the transphenoidal route there were 24 deaths, a mortality of 6.8 per cent; in 239 cases operated upon by 13 surgeons by the intracranial route there were 29 deaths, a mortality of 12.5 per cent. These figures would appear to indicate that the mortality following the intracranial route is generally higher than that following the transphenoidal route; but a study of the data at hand shows that this is not the case. From the reports of 14 neurologic surgeons we find that 7 had not operated by the transphenoidal route at all; and of the 7 who had used this route, 1 surgeon, whose mortality was very low, had operated upon 80 per cent of all the cases. On the other hand, all of the 14 surgeons had used the intracranial route; and with a more widely distributed and therefore a higher mortality. A comparison of the mortality of individual surgeons who had used both types of operation shows that it is approximately the same; if anything somewhat lower following the intracranial approach.

While the reduction in the mortality of the intracranial approach has been a factor in shaping the trend of opinion in favor of the intracranial route it would not appear to have been the important factor; for surgeons with the widest experience in the surgery of hypophyseal lesions continued to advocate the transphenoidal route long after the mortality of the two operations was the same. More important perhaps was a growing belief in the minds of many that the results following the transphenoidal approach were unsatisfactory. How unsatisfactory they have been has never yet been made clear; for the reports of the results obtained which have appeared in the literature have been so vague as to make an accurate estimate impossible. From a tabulation in Cushing's monograph (15, 1912) we find that of 32 cases in which a transphenoidal operation was done, 8 were greatly improved, some with restoration of vision; 15 are called improved, some only temporarily; 5 were not improved; 4 died. In a later report of 68 cases (1914) 61 of which survived operation, Cushing (16) found that in 22 cases progressively failing vision had become stationary or had been slightly improved for a few months to several years; in 22 cases there was a prompt widening of the visual fields with marked improvement in vision; in 2 cases the vision was made worse but later it improved; in 5 cases in which vision was lost there was a partial return in 2; in 8 cases there was no improvement at all; and in 3 cases there was progressive failure of vision in spite of a successful operation. Still later (1922) he (17) reported that the immediate results in 154 cases of adenoma operated upon by the transphenoidal route showed an improvement of vision and widening of the visual fields in 50 per cent; a remarkable improvement with retardation of the disease in 20 per cent; and a failure of improvement in 20 per cent. He found that it was more difficult to give an exact idea of the late results, for as he rightly states they depend upon many factors. But it is evident that 75 to 80 per cent of the cases which survived operation failed to regain useful vision for any length of time, and had recurrences or died within 2 years of operation; while 20 to 25 per cent had preserved useful vision for 5 years and sometimes for 10 years. Since 1922 I have been unable to find any reports of late results from Cushing's clinic. His then associates, Dott and Bailey, in 1926, reported upon the pathological anatomy, clinical aspects, symptomatology, diagnosis, and treatment of 162 cases of hypophyseal adenoma but failed to include the results of treatment. It is evident from their paper that the transphenoidal approach remained as late as 1926 the operation of choice for hypophyseal adenomata. Hirsch (44), in 1912, reported upon 26 cases operated upon by his endonasal method and found that 12 with visual disturbances were improved but of these only 2 were considerably improved for 1 year, 3 were slightly improved 1 to 2 years, 7 were slightly improved for less than a year; while 8 were not improved at all; 3 died. In a later report (1914) upon 37 cases he (46) finds that 21 were improved over long periods of time but gives no statement of the time or the quality of the improvement; 5 were improved for 2 to 6 months, followed by a return of symptoms; 4 were unimproved; and 5 died. In 1926, he (47) reported upon 100 cases operated upon by the endonasal approach but unfortunately failed to give any results.

I shall not go farther in a citation of statistical results for to do so would not elucidate the subject. I have pretty thoroughly covered the literature of the subject since 1900 and it becomes evident that a collection of small series and scattered single reports does not improve the results; naturally it rather makes them worse. The adenomata, the adenomatous cysts, and other intrasellar cysts being the only lesions from which results could be expected by the transphenoidal approach, the results of Cushing and Hirsch which I have just quoted would seem the best that could be hoped for by this operation alone. That it brings only temporary relief in the large proportion of cases, that it is followed by rather prompt

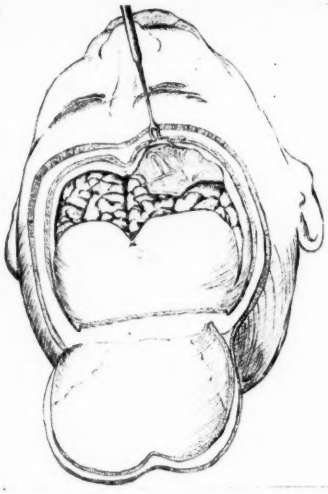


Fig. 2. The approach to the hypophysis suggested by Kiliani. (Ann. Surg., 1904, xl, 35.)

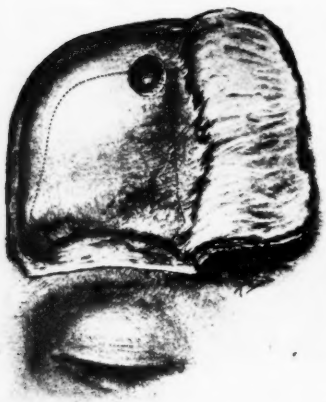
recurrence of symptoms, and that it fails to prevent the intracranial extension of hypophyseal tumors (adenomata) has been the opinion of many for over 10 years.

To attempt to compare the results of the transphenoidal operation with those of the intracranial operation (transfrontal or lateral frontal) at the present time is almost futile. The results obtained by the intracranial approach as reported in the literature are as meager and indefinite as those of the transphenoidal route. Moreover, in the reports of intracranial operations, the many lesions met with by this route are often not specifically designated, so that comparisons are difficult. It would, of course, be ridiculous to compare the results obtained from operations for adenomata of the hypophysis by the transphenoidal route with those from operations for craniopharyngeal duct tumors by the intracranial route; and the only comparison of results which fairly can be made by the two methods is that of operations for pituitary adenomata. Data allowing such a comparison are not yet available in the literature. Neither Cushing nor Frazier nor others who have had a large experience with both methods have as yet reported comparative results. In 1920, I reported a series of cases operated upon by an intracranial route among which were 7 cases of adenoma which survived the primary operation, and in my Cincinnati series are 8 additional cases. Of the 15 cases of adenoma operated upon by my lateral frontal approach 2

Fig. 3. McArthur's approach showing the outline of the skin incision. (Surg. Clin., 1918, xi, 691–699.)

at last report had excellent vision and were free from any signs of recurrence 5 years after a second operation (both had secondary operations for recurrence at 2 years and 1 year respectively); 5 have excellent or normal vision without signs of recurrence (except possibly 1) over 2 and up to 3 years after operation; and 3 have good to normal vision and no signs of recurrence from 1 to 2 years after operation. Five died from 4 months to 2 years presumably from recurrence and 1 (known to be living until recently; operation February, 1923) has not reported. The series as will be seen is still too small, nor has sufficient time elapsed, to draw conclusions; but such as it is, it promises better than the available results of the transphenoidal route. We must finally come down to the statements of surgeons rather than their published reports; and I find in writing to the various members of the Society of Neurologic Surgeons that men who have had the largest experience with both methods of approach (Cushing, Frazier, and others) now state that they are getting better and more permanent results with the intracranial than with the transphenoidal approach.

If we accept the opinions expressed, what is the possible explanation for the improved results following operations for adenomata by the intracranial route—understanding by improved results the most important results that any surgical procedure has achieved, i.e., the improvement in and the preservation of vision? It will be recalled that for many years the supporters of the transphenoidal route made certain claims for it, i.e., that by a sellar decompression it best met the indication of persistent and severe "sellar" headaches; that it was the ideal method for the evacuation of intrasellar cysts whether adenomatous or derived from Rathke's pouch; and that it would probably always remain the operation of choice for intrasellar solid adenomata which had not yet extended widely into the intracranial space. In



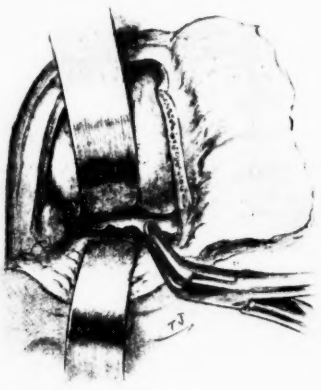
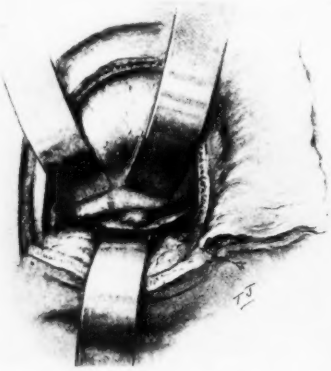


Fig. 4, left. McArthur's approach. Outline of the bone removed which subsequently is replaced as a free transplant.
Fig. 5. McArthur's approach. The roof of the orbit is removed.

the last group of cases (the solid adenomata) it was argued that the opening of the dural capsule through the sellar floor permitted the downward dislocation of the tumor thereby preventing or relieving pressure of the tumor upon the chiasm, and that it allowed the tumor to grow downward into the sphenoidal sinus rather than upward into the intracranial space because it did not, like the intracranial approach, interfere with the natural barrier to upward growth, i.e., the tentorium sellæ or sellar diaphragm. As late as 1926 Dott and Bailey supported these views; and I find that a few of the neurologic surgeons still support them today.

When one attempts to discover the basis of these views he finds little to support any of them. Such reports as are available in the literature and our own experience with cases treated elsewhere by a "sellar decompression" would indicate that relief of headaches if obtained in solid adenoma is but temporary—so temporary as scarcely to warrant the operation done for their relief. On the other hand, our own experience makes it appear certain that by the intracranial approach with the partial removal of the tumor the headaches are more permanently relieved. So far as I can determine, only one group of cases, those with acromegaly and sellar headaches but with-



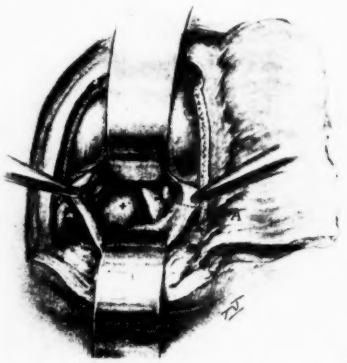


Fig. 6, left. McArthur's approach. Showing the point at which an incision is made in the dura.
Fig. 7. McArthur's approach. The dura is opened and the frontal lobe elevated. *X* represents the hypophyseal tumor. *A* represents one of the optic nerves.

out visual disturbances, might conceivably better be treated by the transphenoidal approach, and these not because the relief of headache is more certain or more permanent but because the transphenoidal approach is probably safer; for it is true that the intracranial operation in acromegalics is prone to the complication of postoperative clot. But even in this group of cases it is probable that X-ray therapy will better meet the indications than will a sellar decompression, a matter which I shall subsequently discuss. Nor is there any suggestion of proof in the literature that the intrasellar cysts, whether adenomatous or derived from Rathke's pouch, or the solid adenomata may be better treated by the transphenoidal than by the intracranial approach. The idea that they could seems based upon the supposition that the sellar diaphragm prevented the upward growth of these lesions and that they were therefore inaccessible by the intracranial approach until very late in the disease. This idea was seriously questioned by Cope in 1916. He showed by anatomical studies that between the sellar diaphragm and the optic chiasm lies a large subarachnoid space, the cisterna basalis, so that these two structures are separated from each other a distance of 1 centimeter; and he stated that any cyst or tumor arising within the sella turcica would have to protrude well upward into the intracranial space before it could exert pressure upon the optic nerves or chiasm. All available autopsy records of deaths following operation have supported his view; for a majority of all patients with pituitary tumor who die after operation show an intracranial extension of varying size. Moreover, in 1920, we reported that we had found by the consistent use of an intracranial approach that every pituitary tumor or cyst associated with visual disturbances had at operation extended well into the intracranial space, so that we felt we could state that every pituitary lesion presenting visual disturbances was of necessity an intracranial lesion. Our experience since that time has invariably supported this view.

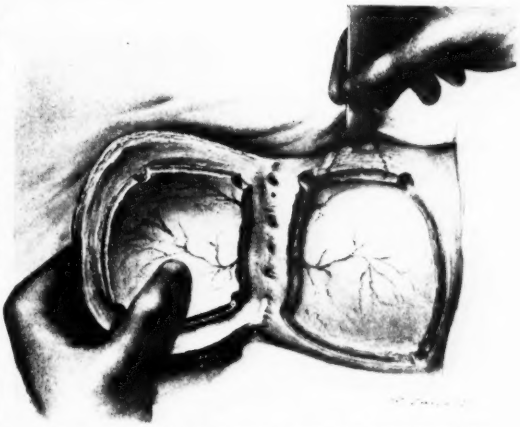


Fig. 9. Frazier's transfrontal approach showing reflection of osteoplastic flap and outline of portion of supraorbital ridge removed.

Fig. 8.

Fig. 10.

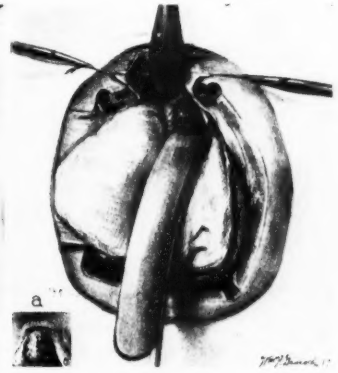


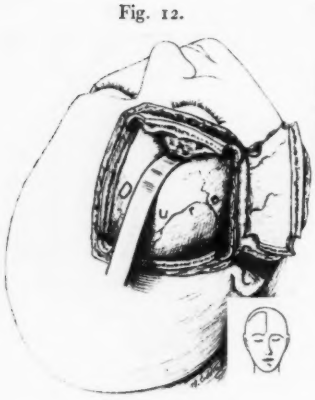
Fig. 11.

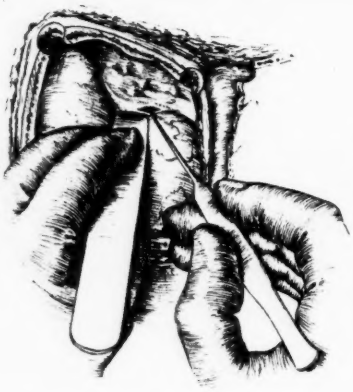
Fig. 8. The transfrontal approach of Frazier; showing the incision in the scalp. (Surg., Gynec. & Obst., 1919, xxix, 9.)

Fig. 10. Frazier's transfrontal approach. The dural flap has been reflected. A dural incision is carried downward and backward over the roof of the orbit so as to facilitate the exposure of the hypophysis.

Fig. 11. Frazier's transfrontal approach. The frontal lobe is elevated and the hypophyseal tumor and optic nerves are brought into view.

Fig. 12.





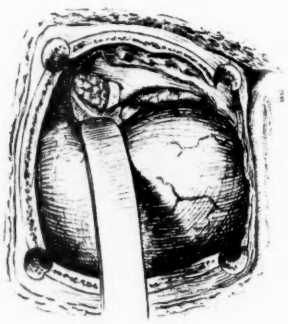


Fig. 13.

Fig. 14.

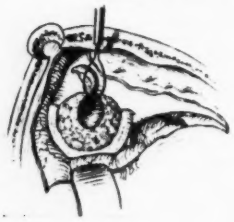


Fig. 15.

Fig. 12. Cushing's modification of Frazier's earlier transfrontal approach. (Arch. Ophth., 1929, i, 1–14; 168–205.)

Fig. 13. Cushings' transfrontal approach. Showing the point at which the dura is opened.

Fig. 14. Cushing's transfrontal approach. The dura has been opened, and the tumor brought into view. (Suprasellar meningioma.)

Fig. 15. Cushing's transfrontal approach showing method of removing certain tumors with the electrosurgical loop.

The sellar diaphragm, therefore, does not prevent the upward or intracranial extension of pituitary lesions; nor does it, as is shown by the 80 per cent recurrences following the transphenoidal operation after the floor of the sella turcica has been removed.

Since these facts were established there has been nothing to support the contention that the adenomata, the cystic adenomata and cysts are more accessible by the transphenoidal route; for they all, when they have produced visual disturbances (the important operative indication), project into the intracranial space and therefore are accessible by the intracranial route. Not only are they accessible but their size, their extension, and their relationships to important surrounding structures may be determined. Through a process of reasoning at present obscure, it was argued by many in the literature that it was preferable in dealing with pituitary lesions to remove a portion of the lesion remote from the optic chiasm rather than that portion directly impinging upon the chiasm. The advantage of the intracranial approach is that it permits precisely this—the removal of that part of the lesion which directly compresses the chiasm; and this we believe is the reason for the improved results following the intracranial method. The statement applies particularly to the solid adenomata; but it is probable that the wider excision of the walls of adenomatous and other cysts made possible by the intracranial method has contributed to the longer period of freedom from recurrence.

Perhaps another factor of considerable importance in determining the trend of opinion in favor of the intracranial approach has been the growing appreciation of the variety of lesions about the optic chiasm amenable to surgical treatment. The impetus responsible for the development of surgical approaches to the chiasmal region was the recognition by Marie and Marienesco and by Babinski and Froehlich of the association of pituitary tumor with the clinical pictures of acromegaly and dystrophia adiposa genitalis; and surgical approaches to the chiasmal region were primarily developed with the sole purpose of attacking pituitary tumors. For a considerable period of time they were the chief concern of the surgeon; and it was natural that his ingenuity should have been directed toward the perfection of approaches, such as the transphenoidal approach, which permitted him most safely to attack them. But it became apparent that other lesions about the chiasm may cause visual disturbances

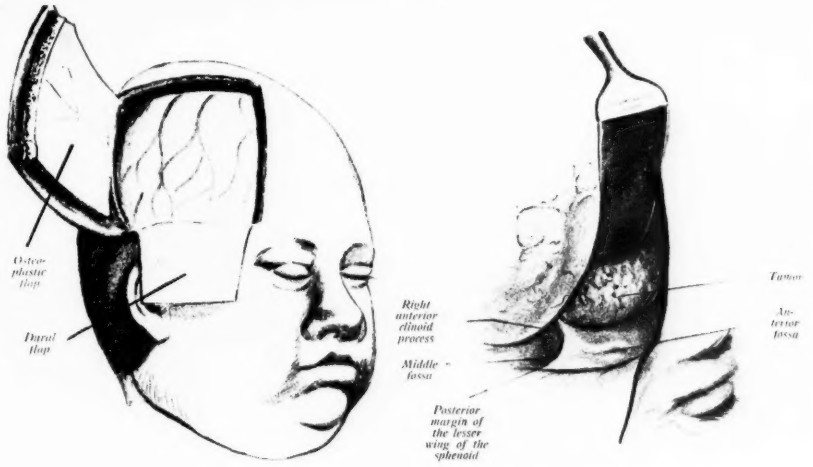


Fig. 16. Krause's lateral frontal approach showing the position of the osteoplastic flap.

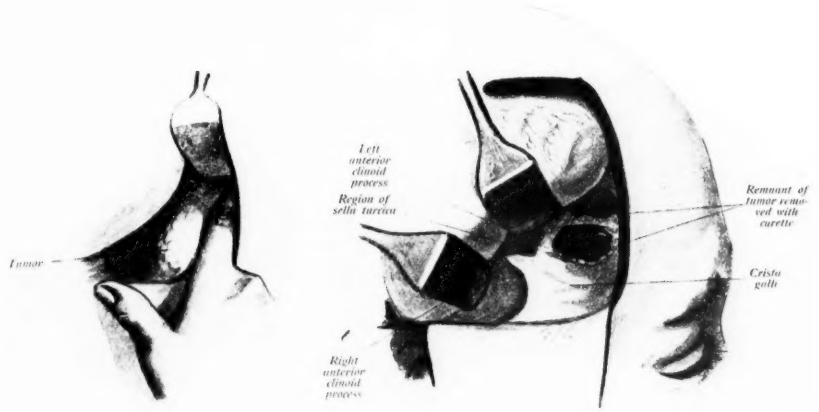


Fig. 17. Krause's lateral frontal approach showing the exposure of the chiasmal region.

and sometimes the glandular symptoms and sellar abnormalities of pituitary tumors; and gradually—and it is to be emphasized chiefly through the use of the intracranial approach—a whole series of pathological conditions about the optic chiasm have come to be recognized. I have not made an effort to determine when and by whom the first suprasellar craniopharyngeal duct tumor was clinically recognized and subjected to operation; but it was one of the early lesions which called attention to the fact that there were conditions about the chiasm other than intrasellar pituitary tumors which required surgical therapy. Gradually a number of lesions, diverse in their pathology, but clinically similar in that they all cause visual disturbances, has come within the sphere of the neurologic surgeon: the craniopharyngeal duct tumors which may be intrasellar but are usually suprasellar; the cholesteatomata; the dermoids and teratomata; the gliomata arising from or about the infundibulum; the gliomata of the optic nerves and chiasm; the meningiomata

Fig. 18. Heuer's lateral frontal approach showing the outline of the osteoplastic flap. (Arch. Surg., 1920, i, 368.)

arising from the tuberculum sellæ and other similar tumors as the parasellar, prechiasmal, and posterior olfactory groove tumors; the suprasellar adenomata; and the occasional aneurisms. In addition to these—with the exception of the occasional aneurism, all tumors—is at least one nontumorous condition which, like the tumors, may cause visual disturbances; the so-called chronic cisternal arachnoiditis, 4 cases of which we have subjected to operation in the past 2 years, and with results thus far eminently satisfactory. That other conditions may be brought to light as soon as the ophthalmologists consider the surgical possibilities in the group of cases now more or less indiscriminatively included under the term "primary optic atrophy" seems more than likely.

From a consideration of this variety of lesions about the optic chiasm, it becomes apparent how greatly previous conceptions have of necessity changed. The earlier reports of hypophyseal surgery were concerned with the improvement in the acromegalic or other so-called glandular symptoms; but we have learned that these may be but slightly affected by surgery. We are now more concerned with the visual disturbances caused by a variety of conditions of which pituitary tumors are merely one. They, with the exception of the intrasellar pituitary adenomata and cysts, are all suprasellar tumors accessible only by an intracranial approach; and since, as we have attempted to show, the intrasellar, adenomata and cysts may also more advantageously be treated through this approach, the transphenoidal operation has now practically become obsolete.

Our present attitude, then, with reference to the surgery of the chiasmal region is that we must be prepared to meet and to deal not with a single group of tumors but with a variety of pathological conditions which cause optic atrophy and serious visual disturbances. Clinically, some of these lesions (pituitary adenomata, cystic adenomata, intrasellar cysts, some of the craniopharyngiomata, etc.) may be associated with sellar deformities, hemianopsias, and glandular derangements as indicated by acromegaly and dystrophia adiposa genitalis; others (craniopharyngiomata, suprasellar meningiomata, suprasellar adenomata, gliomata of the chiasm, etc.) may be associated with visual field defects alone (usually bitemporal) and quite in the absence either of abnormalities of the sella turcica or of derangements of internal secretion; while still others (cisternal arachnoiditis) may present simply optic atrophy and loss of vision without even (although they may present) characteristic visual field defects. The symptoms common to them all are optic atrophy and loss of vision; and surgically, our chief concern, regardless of other symptoms which may be present is the preservation or the restoration of vision. In the exposure of these various lesions the intracranial approach alone suffices; for it brings them all into view so that their pathology, their extent, and their involvement of neighboring structures may be appreciated and properly interpreted with respect to surgical treatment. Whether this intracranial approach should be the transfrontal, as devised by Frazier and adopted and modified by Cushing and others, or the lateral frontal as devised by me and adopted and modified by Adson, Dandy, and others, may well be left to the individual surgeon, for both with equal safety and with few complications apparently give sufficient exposure to recognize and deal with lesions about the chiasm. One complication attending the transfrontal approach which has not yet, so far as I am aware, been noted in the lateral frontal approach is a disturbing and sometimes alarming fall in blood pressure during the elevation of the frontal lobe directly from in front. Frazier (34) has called attention to this and has therefore more recently and without thus far observing this complication, elevated the frontal lobe from the side as we do in our lateral frontal approach. Cushing (20), although he does not comment upon it, has described a similar fall in blood pressure.

Fig. 19. Heuer's lateral frontal approach showing the exposure of the hypophyseal tumor and optic nerve.

TYPES OF TUMORS

After a period of more than 20 years, having arrived at some unanimity of opinion regarding the proper approach to lesions about the optic chiasm, but having only in recent years, and largely through this approach, appreciated the variety of lesions which may cause visual disturbances, it is but natural that their treatment cannot yet be considered settled. Indeed, one might say that only now are we in position to gain more accurate information regarding the treatment and the results of treatment of lesions about the chiasm; for since, as we have noted, the majority of surgeons interested in this field have come to realize the necessity of their proper exposure, the entire clinical material rather than a small fraction of it as heretofore will become available for accurate study. Nevertheless, some advances have been made and we may set forth the present ideas regarding the treatment of the various lesions which we have discussed.

1. *The chromophil adenomata associated with acromegaly.* In the treatment of chromophil adenomata associated with acromegaly, there are 3 phases of the condition which come up for con-

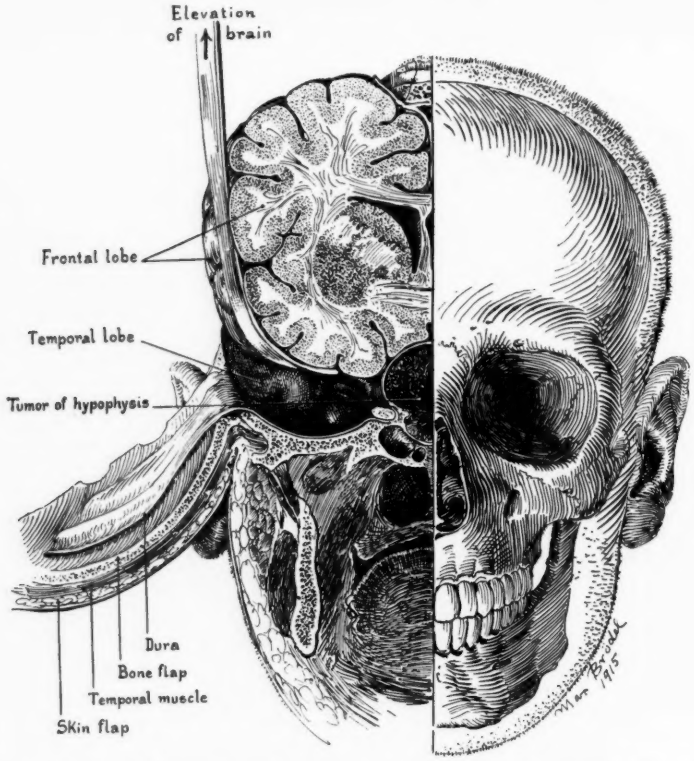


Fig. 20. Heuer's lateral frontal approach. Semidiagrammatic sectional view of approach.

sideration: (1) the possibility of bringing about a recession of the condition of acromegaly or of halting its progress so as to prevent the late and often fatal manifestations of cardiac and other visceral enlargement and tissue hypertrophies; (2) the relief of the often severe "sellar" headaches; and (3) the prevention of visual disturbances or the checking of their progress if present or the restoration of vision. One of the difficulties confronting us in this as in other forms of hypophyseal adenoma is that we know practically nothing regarding the factors which control its life history. It has been an experience common to many that acromegaly is a condition subject to remissions; or one which reaches a certain stage in its development and then becomes more or less stationary. It may, then, not progress beyond a certain stage or may not for many years, if ever, reach its late stages. Headaches present in the early stages of its development may spontaneously disappear and not recur. Visual disturbances may never appear or if present may become stationary. If we ascribe the symptoms of acromegaly to the chromophil adenoma then the clinical data indicate that the tumor in some cases is subject to alternate periods of growth and retardation in growth or may reach a certain stage in its development and become stationary. Similar clinical data indicate that the chromophobe adenomata associated with Froehlich's disease are likewise subject to variations in their growth and also may become stationary. It is difficult, then, to know in the earlier stages of acromegaly how to proceed, and, if we do institute some form of therapy how correctly to interpret the results of our therapy; for it must be certain that some, if not many, of the brilliant late results of our surgery in pituitary adenomata are nature's results, not ours. These variations in the growth and therefore the clinical manifestation

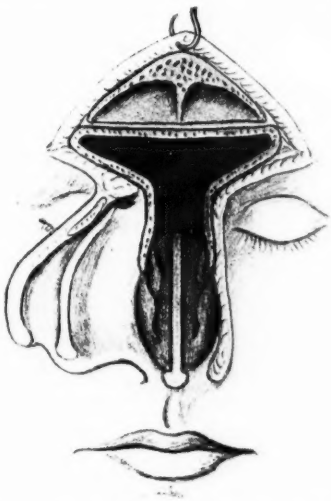


Fig. 21, left. Eiselsberg's superior nasal transphenoidal approach showing outline of incision. (Ann. Surg., 1910, lii, 1.)

Fig. 22. Eiselsberg's superior nasal transphenoidal approach showing the nose reflected to one side and the superior nares exposed.

of pituitary adenomata are, however, not peculiar to these tumors, and it would seem quite as legitimate in these as in tumors elsewhere to try to influence the course of the disease. Two groups of cases may be discussed; (a) a group with advancing acromegaly and sellar headaches but

Fig. 23. Kocher's superior nasal transphenoidal approach. The straight lines indicate the skin incisions; the wavy lines the additional incisions through the bone. (Deutsche Ztschr. f. Chir., 1909, c, 13.)

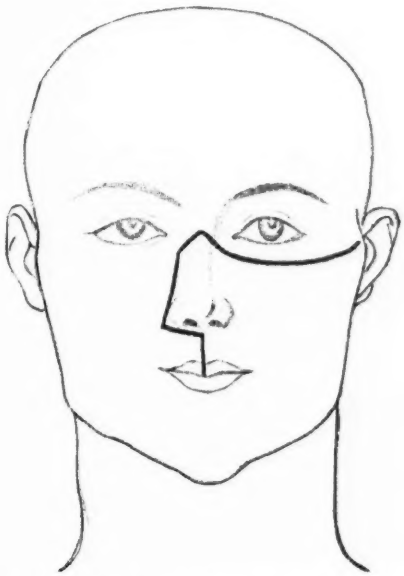


Fig. 24. Nowikoff's transphenoidal approach involving temporary resection of the superior maxilla. (Centralbl. f. Chir., 1913, xl, 1001.)

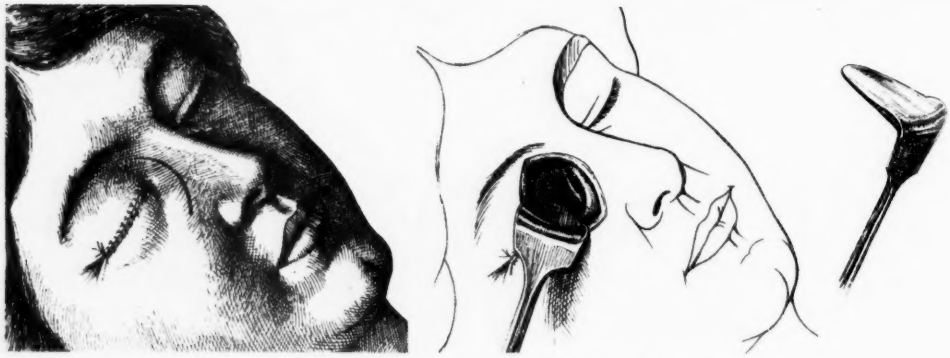


Fig. 25. Chiari's transphenoidal approach. (Arch. f. klin. Chir., 1922, cxxi, 490.)

without visual disturbances and (b) a group with acromegaly and definite visual disturbances.

In the presence of advancing acromegaly with sellar headaches two methods of treatment have been and are at present available—operative and deep X-ray treatment. The former has been used in the past chiefly in the attempt to relieve the later and associated symptoms of visual disturbances; but it was noted in the earliest successful case of acromegaly operated upon by the transphenoidal route (Hochenegg) and has since been noted in isolated case reports that there was, following the partial removal of the adenoma, a measurable recession in the size of the nose, hands, and feet and a loss in weight. The number of such successful results as can be culled from the literature is not large and there has been a distinct impression that the results achieved from the standpoints of the recession of tissue overgrowth and the permanent relief of sellar headaches have not been satisfactory. In how far such operative efforts have prevented the progress of the condition cannot at present be accurately estimated. More recently (1927) Cushing (18) has again considered the matter and states that accumulated experience justifies the statement that the symptoms of acromegaly may be favorably influenced by the partial removal of the hyperplastic gland. He reports 3 cases with acromegaly in which the primary indication for operative interference was visual disturbances but in which the incidental postoperative results in 2 were a recession and an apparent checking of the acromegaly. But the interest in this paper lies rather in the consideration of the cases of progressing acromegaly with sellar headaches but without considerable enlargement of the sella turcica and without visual disturbances. In the 3 cases of this sort which the author reports—all operated upon by the transphenoidal approach—there was a diminution in the size of the hands, a loss in weight, and the relief of headaches with an apparent checking of the disease for 1 year in 2 cases and 10 months in the third. His criteria for estimating the effects of the operation were the changes in the size and weight, in the basal metabolic rate, and in the blood sugar percentage.

The X-ray treatment of pituitary adenomata has gradually grown in favor. To Béclère is due the credit for placing this method of treatment on a firm foundation and since his original publications it has been used by a constantly increasing number of observers. Kuepferle and von Szily, in 1926, collected from the literature 73 cases of hypophyseal tumor treated by X-ray therapy, 22 of which were associated with acromegaly. Of the 22 cases they find that 12 were markedly influenced. Not only was the condition often apparently arrested but in some cases there was a recession in the condition. In practically all the 12 cases the headaches were improved or entirely relieved. The visual disturbances were favorably influenced. The 10 other cases were also favorably influenced in that there was improvement in their headaches and visual disturbances. In only 1 case is a recurrence of symptoms noted. Dott and Bailey record 53 cases of pituitary adenoma from Cushing's Clinic in which between 4 and 8 series of X-ray treatments were given, and they conclude that the growth of the tumor may usually be retarded and an actual reduction in its size sometimes effected. But they fail to state specifically the results in tumors with acromegaly and with Froehlich's disease, respectively. They call attention to the dangers in the treatment, such as aggravation of the headache

Fig. 26. Kanavel's inferior nasal transphenoidal approach showing the skin incision. (Surg., Gynec. & Obst., 1918, xxvi, 61.)

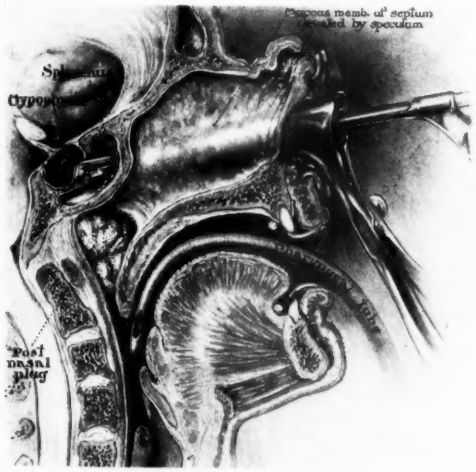


Fig. 29. Sectional view of transphenoidal approach.

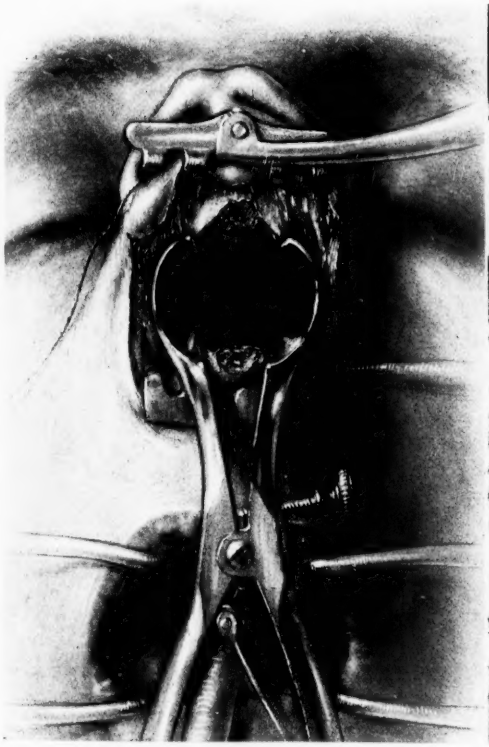


Fig. 27. Kanavel's transphenoidal approach. The nose is reflected upward and the speculum is in position.

Fig. 28. Kanavel's transphenoidal approach showing the position of the patient; the use of a headlight, etc.

Fig. 30. Cushing's modification of the sublabial transphenoidal approach. (J. Am. M. Ass., 1914, lxiii, 1515.)

and visual disturbances. In another paper Bailey states as his opinion that X-ray treatments may be tried, provided the patient is not in imminent danger of losing his eyesight, that the visual fields can be carefully followed, and that the patient can be operated upon if vision continues to decline. In a recent personal communication, Bailey writes that thus far in his Chicago experience he has not operated upon any of the 6 cases of pituitary adenoma which have come under his observation. Two were cases with acromegaly which promptly improved with X-ray therapy; while 4 were chromophobe adenomata (1 blind) which remained stationary under X-ray therapy. Towne, among others, has recently reported upon the subject; and records 4 cases (presumably chromophobe adenomata) all of which have been most satisfactorily treated by X-ray.

It would appear, then, from such data which are at present available that the group of cases with advancing acromegaly and sellar headaches but without visual disturbances may quite justifiably first be treated by X-ray therapy; and, if this fails to check the progress of the disease or relieve the sellar headaches, surgery with the partial removal of the gland may be considered. It has been stressed that the technique of application of the X-rays is important and the technique of Bèclére, Sosman, and others should at least be familiar to those who undertake this treatment. The failure to apply the treatments properly may explain some of the negative results obtained. But it is certain that in spite of the enthusiasm of a few observers X-ray therapy will fail in some cases as it has in other conditions. Moreover, it should be given only with the approval and guidance of the neurologic surgeon.

In the group of cases with acromegaly and with definite visual disturbances, our viewpoint with regard to treatment is slightly different. While we may hope to diminish or check the signs and symptoms of acromegaly our chief concern is the preservation or restoration of vision. It is a nice question in judgment whether to proceed at once to operation, removing that portion of the adenoma which compresses the chiasm and optic nerves, or to resort primarily to X-ray treatments, holding operative treatment in reserve should it become necessary. It is apparent that at the present time no general rules can be formulated. If vision is but slightly affected, X-ray treatments may quite justifiably be tried; if almost lost it may appear unwise to risk the hazard of X-ray treatments and proceed at once

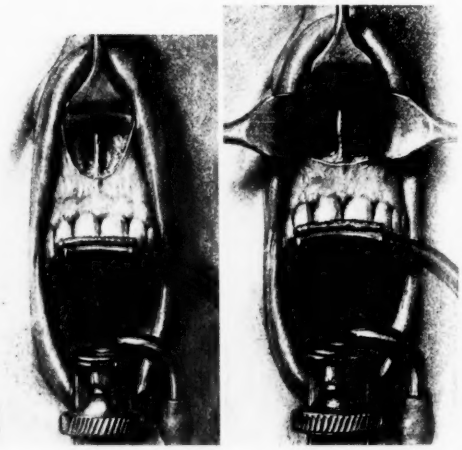


Fig. 31, left. Cushing's transphenoidal approach. The lip is retracted upward and the septum is isolated by stripping the mucous membrane to the side.

Fig. 32. Cushing's transphenoidal approach. Further step in the isolation of the nasal septum. The lateral retractors hold the nasal mucous membrane to the side

to operation. Our personal experience in this group of cases is very limited and we have thought it advisable to operate primarily on such cases as have come under our observation. But, from the results reported in the literature, vision has been improved or the decline of vision checked in a small but increasing number of cases. But the experience as far as it goes indicates, as I wish again to emphasize, that the symptoms in certain cases may not be favorably influenced by X-ray treatments and progress; or that they may be checked or improved for a time and then recur and progress in spite of further treatments. Whether in the former instance the lesion is a cyst unaffected by X-ray therapy or, in the latter, and because of the X-ray treatments, has become a cyst due to the degeneration of a previously solid adenoma, is not yet clearly proved but is suggested by a few observations. The dangers in the indiscriminate and improperly checked use of X-ray therapy in this group of cases are very real and this method requires the closest co-operation of the ophthalmologist, roentgenologist, and neurologic surgeon; the last of whom should be prepared to operate at once if vision suddenly or otherwise declines.

2. *The chromophobe adenomata associated or not with Froehlich's disease.*

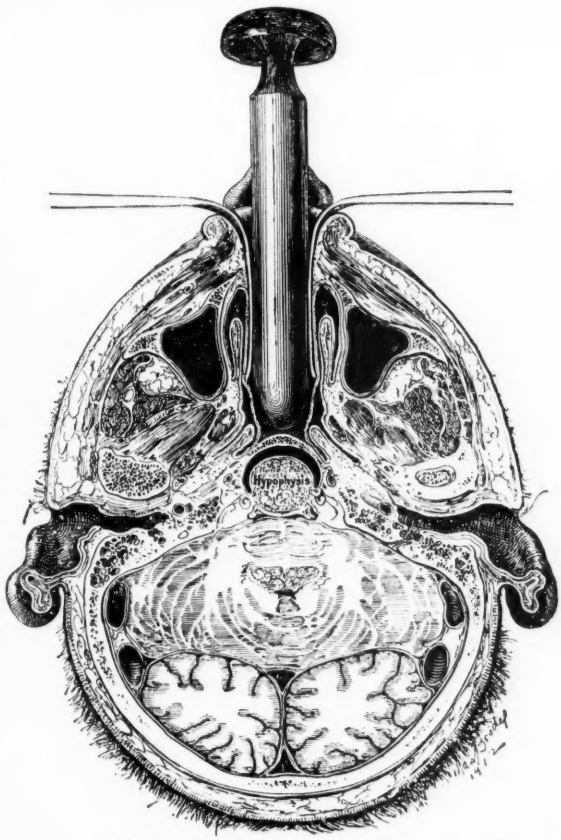


Fig. 33. Cushing's transphenoidal approach. To show the flattening of the turbinates to either side by metal plugs. The septum has been removed.

Fig. 34. Cushing's transphenoidal approach. Sectional view.

Chromophobe adenomata, as is well known, may be associated with Froehlich's syndrome or may occur in the total absence of clinical manifestations of glandular derangement. In comparison with the preceding group of cases, we have less evidence that an attack upon the tumor influences, if they are present, the various metabolic and sexual abnormalities included under hypopituitarism although it is, of course, true that the menses may for a time re-appear after a period of amenorrhœa. We might expect from our experience with the thyroid—in which we observe at times following the removal of a large cyst or calcified adenoma a rise in the previously abnormally low basal metabolic rate and an improvement in the symptoms of hypothyroidism—that the removal of a tumor would perhaps relieve the pressure upon

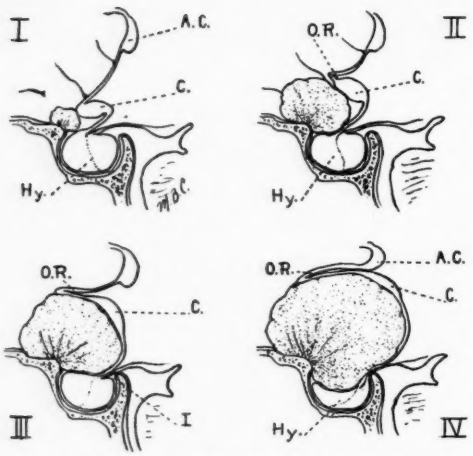


Fig. 35. Diagram showing the origin and growth of the suprasellar meningiomata. (From Cushing. Arch. Ophth., 1929, i, 1–14; 168–205. Fig. 70.)

such normal cells as may be present and so allow them to function more normally; or that X-rays would achieve the same object. Thus far in our experience, however, we have, aside from the re-appearance of the menses which usually has not been permanent, failed to observe any noteworthy changes in the adiposity, basal metabolic rate, or sugar tolerance. Our chief concern at the present time is, then, the preservation or restoration of vision; and exactly the same questions arise with regard to X-ray and operative treatment which we have just discussed in connection with the chromophil adenomata associated with acromegaly and visual disturbances. That the chromophobe like the chromophil adenomata respond favorably to X-ray therapy is indicated by a slowly accumulating experience. In the series of 73 cases of pituitary tumor previously noted (64) there were 16 cases of chromophobe adenoma associated with dystrophia adiposa genitalis and 34 cases without symptoms of Froehlich's disease. Of the 16 cases with Froehlich's disease practically all showed a considerable improvement in vision. But in only 6 cases was there any improvement in the symptoms of Froehlich's disease and in none a return of the sexual function. In 18 of the 34 cases without symptoms of Froehlich's disease, there was great improvement in vision; in 14 cases only a slight improvement or a checking of the loss of vision. Bailey and Towne, as I noted under the discussion of the chromophil adenomata, have had favorable results in the improvement of vision or in checking its further loss. My own experience in checking recurrences following operation has thus far been very satisfactory. There remains then in this group of tumors the same problem as in the preceding; and in the final analysis the question of whether operation or X-ray shall be the primary method of attack must be left to the judgment of the surgeon.

3. *The suprasellar adenomata.* Occasionally pituitary adenomata are found occupying a suprasellar position without first having expanded and partially destroyed the sella turcica. They, therefore, differ clinically from the usual chromophobe adenomata in that they give rise to visual disturbances in the absence of sellar changes and often in the absence of constitutional symptoms. They may arise from an anlage in the hypophyseal stalk above the diaphragma sellæ or they may have their origin within the sella and escape through a malformed diaphragm or an abnormally large foramen diaphragmatis without having previously enlarged the sella turcica. That anatomical variations in the size of the latter opening occur is well known. The treatment of these suprasellar adenomata is naturally that of other adenomata causing visual disturbances; but in view of the fact that they are prone to be confused with other suprasellar lesions which fail to deform the sella turcica they are more likely to be subjected to primary operative treatment than if their true nature were recognized.

In addition to the specific remarks which we have made regarding these three groups of tumors, some general remarks applying to them all may not be inappropriate. If surgery is contemplated in the group of cases with acromegaly but without visual disturbances we leave open for the present the question whether the approach should be by the transphenoidal or intracranial route; for we do not have sufficient data at present upon which to form an opinion. But in all groups with visual disturbances we believe that the intracranial exposure of the tumor with the removal of that portion which compresses the optic chiasm and nerves is the operation of choice. The introduction of postoperative X-ray treatments in the three groups of cases has simplified and rendered more safe the operative treatment; for while formerly we were tempted to deal radically with the lesion in the hope of preventing an early recurrence and consequently increased our mortality, we are now content to remove the part of the tumor compressing the chiasm and nerves, trusting to X-ray therapy to prevent a recurrence. While it is not proved that this method of procedure is wholly justified repeated experiences in

which symptoms of recurrence after operation have promptly been checked by a series of X-ray treatments lend support to it.

4. *The pituitary adenocarcinoma (malignant adenoma).* We have at the present time too little data to formulate any special remarks regarding treatment. For the present the treatment as outlined for the chromophil and chromophobe adenomata is followed.

5. *The intrasellar cysts.* The intrasellar cysts are those derived from the chromophil and chromophobe adenomata and the cysts derived from Rathke's pouch. The heading implies that they have their origin within the sella turcica and while they may cause clinical evidences of hyperpituitarism and hypopituitarism they do not cause visual disturbances until they have extended into the intracranial cavity. With regard to X-ray treatment, we have not yet sufficient evidence to warrant dogmatic statements. The cysts derived from Rathke's pouch could scarcely be expected to respond to this form of treatment, and such evidence as is available would indicate that the adenomatous cysts do not favorably respond. Indeed, the failure of an intrasellar lesion to respond to X-ray treatments is taken by some to indicate a cyst; or the failure of a lesion again to respond after it has primarily responded favorably, to indicate the development of an adenomatous cyst from a previously solid adenoma. Granting that a diagnosis of cyst can be made it would appear at the present time that operative treatment in those cases presenting visual disturbances is the treatment of choice. The intracranial approach exposes that portion of the cyst compressing the optic chiasm and nerves and it is usually possible to remove approximately the upper or intracranial half of the cyst wall. Although we have made the attempt, we have never felt satisfied that we have completely removed the wall of Rathke's pouch cyst and our one apparently complete removal of an adenomatous cyst ended disastrously. It is certain that too radical efforts will be attended by a far higher mortality than the more conservative partial removals and at present there is considerable doubt that greatly more will be accomplished. While the conservative procedure yields very satisfactory immediate results, there is a definite tendency to recurrence and as yet we do not know how to prevent it. Nevertheless, freedom from recurrence may continue over a period of years and in our personal experience with adenomatous cysts only one has recurred under 1 year, while the remainder have remained free from recurrences for 2½ years or longer. The cysts derived from Rathke's pouch

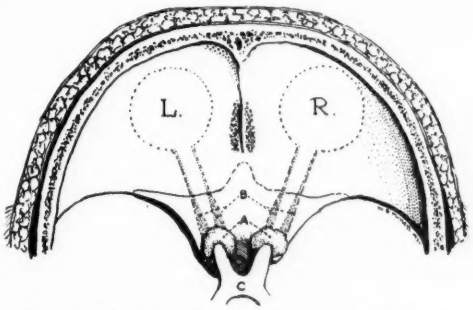
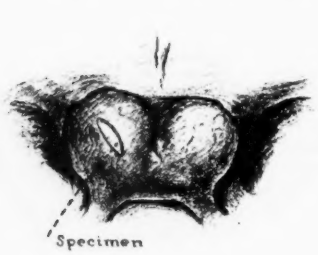


Fig. 36. Diagram of a bilateral prechiasmal intracranial tumor (endothelioma) surrounding the optic nerves. (From Dandy. Am. J. Ophth., 1922, v, 1.)

have generally recurred earlier. In the adenomatous cysts in which at operation there is found a considerable amount of adenomatous tissue, postoperative X-ray treatments would seem desirable; for in one case of this sort in our experience a series of X-ray treatments has apparently checked for a year the signs of recurrence which appeared after the primary operation.

6. *The suprasellar cysts.* We refer to those derived from Rathke's pouch. They compress the chiasm from above and, although not necessarily so, may be associated with symptoms of hypopituitarism. They may flatten the clinoid processes downward or fail to produce any X-ray evidence of sellar deformity. In quite a large percentage of cases (80 per cent in Cushing's experience) they have calcium deposits which are recognizable in the X-ray plate and which are a great aid in diagnosis. They vary in size and condition; they may be as small as a pea or as large as a lemon; they may consist of a simple thin walled cyst or a multicystic, calcified, or solid tumor. They produce pressure upon the chiasm and cause visual disturbances; and these constitute the chief indication for therapeutic measures. There is no positive evidence at present that they respond to X-ray therapy; and operative attack is the only method we, at present, know of dealing with the condition. The intracranial approach will expose them; but their exposure is not always easy. Some present anteriorly in front of the chiasm and are as readily accessible as the adenomata; others present posteriorly so that the chiasm is pushed forward and downward and interposed between them and the surgeon. Under the latter circumstances the lateral approach which we use has some advantages over the frontal for it is sometimes possible to dislocate the chiasm to the side and



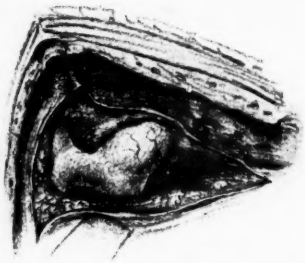


Fig. 37, left. Glioma of the optic chiasm. Showing a symmetrical involvement. (From Martin and Cushing. Arch. Ophth., 1923, lii, 209.)
Fig. 38. Glioma of the optic nerve and chiasm showing unilateral enlargement. (From Cushing. Arch. Ophth., 1923, lii, 209.)

expose the lesion; making unnecessary the transsection of the optic chiasm as occasionally done by Cushing. Not only may their proper exposure be difficult but their treatment even when fairly satisfactorily exposed remains unsatisfactory. The ideal surgical procedure is their total removal but this has rarely been possible. Cushing has stated that he has been able in a number of instances apparently to dissect out completely and totally remove the lesion but this, even with him, must be the exceptional experience. They are invariably, in our experience, adherent to the optic chiasm and wall of the third ventricle and attempts to remove them totally are associated with damage to the region about the third ventricle which results in an operative mortality in the neighborhood of 50 per cent. In our personal experience we have never been able totally to remove the lesion and our radical efforts were attended with such a high mortality that they have been abandoned. If, on the other hand, we content ourselves, as we now do, with the evacuation of the cyst and the removal of its presenting wall, the mortality is almost nil, but the condition almost invariably promptly recurs. The longest period of freedom from recurrence in my experience has been 1½ years; and although we have occasionally been able to tide a patient along by secondary operations we have never been able to prevent the death of the patient from this disease. Should the lesion be solid we are in no better case; for at best we must be content with a partial fragmentary removal.

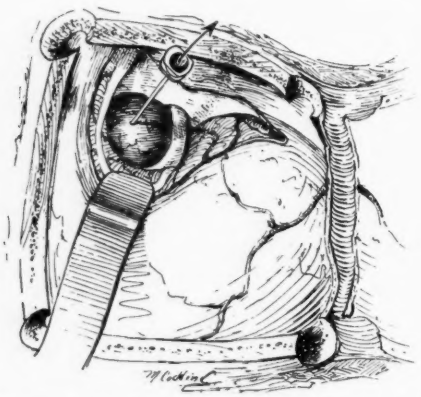


Fig. 39. Suprasellar aneurism presenting between the optic nerves. Operative sketch. (From Cushing. XIII Councilium Ophth., 1929, Hollandia.)

7. *Suprasellar meningiomata.* Isolated examples of suprasellar meningiomata have been reported by Stewart in 1899, by Archibald in 1908, by Heinrichsdorff in 1914, and by Livierato and Cosmettatos in 1916. Holmes and Sargent published an excellent paper on the subject in 1927 and more recently (1929) Cushing and Eisenhardt have made a noteworthy contribution to the pathology, symptomatology, diagnosis, and treatment of these tumors. In our small experience we have never encountered these tumors; and our remarks concerning them do not emanate from personal experience but from data in the literature. The tumors arise from the meninges over the tuberculum sellæ and are more or less intimately attached to the adjacent dura; indeed, nests of tumor cells may be found within the dura or extend through this membrane and into the underlying bone (Cushing). They are slow growing, benign tumors, assuming as a rule a spherical shape and presenting a granular mulberry-like surface. In their growth they push the chiasm upward and backward, the optic nerves straddling the tumor and being separated,

flattened, and elongated. These tumors, then, in their earlier stages produce visual disturbances with bitemporal field defects but without deformities of the sella turcica and without glandular disturbances. In their advanced stages they may cause in addition to visual disturbances, absorption or partial destruction of the sella turcica, signs of hypopituitarism, disturbances in smell, and finally internal hydrocephalus (Fig. 35). In their treatment, X-rays, as in all meningiomata, promise little and these tumors, if a correct diagnosis can be made, should be promptly attacked surgically. Since they are suprasellar in origin they must be exposed by an intracranial approach. Cushing (21) has found that in their removal the excavation of the tumor with the electrosurgical loop has great advantages for it permits the collapse of the remaining shell of tumor which can then be grasped and delivered from its position beneath the chiasm. After the removal of the tumor its point of attachment may be cauterized. The results of the treatment of these tumors still leave much to be desired, but it is evident from a study of the two largest series as yet reported that they depend upon early diagnosis and early operative treatment. Of the 10 cases reported by Holmes and Sargent, all excepting one appear to be advanced cases. In 1 case a decompression was done for the relief of general pressure symptoms; in 8 a partial removal of the tumor only was possible. Of the 7 who survived this operation, 3 showed some improvement in vision, 3 failed to show any improvement, and 1, after a period of temporary improvement, showed evidences of recurrence. In 1 case in the series a total removal of the tumor was accomplished with improvement in vision. It is interesting to compare this series with Cushing's in which either earlier operation was undertaken or different surgical methods permitted a higher percentage of tumor removals. Of the 15 cases which Cushing reports, 1 died unoperated upon and 2 died following operation, 1 from hæmorrhage from the ophthalmic artery. Of the 12 which survived operation the tumor was apparently totally removed in 8, partially and incompletely removed in 4. Of the 8 cases in which a total removal was accomplished there was improvement in vision in one or both eyes in 6; in the 2 remaining there was a checking of further loss or improvement of vision in one eye but a damage to one optic nerve with further loss of vision in the other. There was no evidence of recurrence in this group for from 1 to 12 years. In the 4 cases in which a partial removal was done 1 failed to show any improvement and died in 2 years, 2 failed to improve but are living 3 and 5 years, and 1 shows improvement in vision in one eye 10 months after operation.

8. *Parasellar* (prechiasmal, olfactory groove, sphenoidal ridge, etc.) *meningiomata.* The parasellar meningiomata, similar in their pathology to the suprasellar meningiomata just discussed differ from them in their point of origin and location and therefore in their symptomatology. They arise from the basal meninges at the side or in front of the sella and may implicate the optic chiasm and nerves in their growth. Dandy (24) gave the name "prechiasmal intracranial tumors of the optic nerves" to a presumably rare form of meningioma surrounding the optic nerves at the optic foramina, two instances of which he reported in 1922 (Fig. 36). They produced visual disturbances due to direct pressure upon the optic nerves rather than to implication of the chiasm; and it is noteworthy from the standpoint of diagnosis that the visual fields showed a concentric constriction rather than a form of hemianopsia. The olfactory groove tumors as their name implies arise from the basal meninges along the olfactory groove and in their backward extension may implicate the optic nerves and chiasm. The characteristic symptoms are anosmia, a homolateral optic atrophy, a contralateral choked disc, and mental deterioration (Foster, Kennedy, syndrome). Similarly the sphenoidal ridge tumors arise from the meninges over the sphenoidal ridge and may implicate the optic nerves and chiasm in their growth; and finally a group of these tumors arise from the meninges of the lateral walls of the sella turcica and compress the chiasm and optic nerves as well as in some instances the third, fourth, fifth, and sixth cranial nerves. Although these tumors form a heterogeneous group from the standpoint of their eventual symptomatology yet they have these points in common: that primarily they cause disturbances in vision which remain the important symptom from the viewpoint of treatment and that they are associated with primary optic atrophy and visual field defects which indicate involvement of the optic chiasm or nerves, and, in their early stages, without sellar deformations. In their later stages these tumors may erode and partially destroy the sella turcica; may cause signs and symptoms of pituitary insufficiency, of involvement of the neighboring cranial nerves, and of the uncinate gyrus; and may cause contralateral or bilateral choked disc. In the treatment of all these tumors, surgery alone at the present time is possible; for as we have indicated in discussing the suprasellar meningiomata, there seems little evidence that

they respond to X-ray treatment. For their exposure the transfrontal intracranial approach to the chiasm will suffice for the prechiasmal and olfactory groove tumors; but for those arising from the sphenoidal ridge and extending into the temporal fossa our lateral approach has some points of superiority. For the tumors arising from the lateral wall of the sella and extending downward into the temporal fossa, a temporal approach may be necessary. The results of the surgical removal of these tumors have been satisfactory when removal has been possible. Thus far the number of cases in which removal has been attempted has been small. Correct diagnosis has been difficult and operation resorted to only when the tumor has reached a large size. Cushing (19), in 1927, reported the successful removal of four large olfactory groove tumors; the first in 3 stages without the aid of the electrosurgical loop, the three others in one prolonged stage (up to 9 hours) with the aid of this instrument. The only tumor of the sort in our experience was successfully removed in two stages. In Cushing's cases and in ours there was a most satisfactory improvement in vision with amelioration of other symptoms. Progress in the treatment of these tumors should be in the direction of correct early diagnosis and early operative treatment; for up to the present time they have been so large when exposed that their removal has been a truly formidable procedure.

9. *Gliomata of the optic nerves and chiasm.* The ophthalmic surgeon has long been familiar with the gliomata originating from the optic nerves in their intra-orbital portion and has been aware of the frequent associated involvement of the intracranial portion of the nerves and the chiasm. The neurologic surgeon has much more recently become interested in the primary gliomata of the chiasm and intracranial portion of the optic nerves, and because of the occasional exposure of these lesions by an intracranial approach under the mistaken diagnosis of a suprasellar craniopharyngioma or other tumor. For many years these tumors were variously designated and there was great confusion in their pathological terminology. Verhoeff, in 1922, after a careful study of these tumors concluded that practically all of them are gliomata and since that time they have been referred to under this title. They present on exposure a bulbous enlargement of the optic nerves and chiasm unmistakable when once seen (Fig. 37). Usually the tumor is confined within the sheath of the nerves and chiasm but occasionally, as in one of our cases, it may break through the sheath at one point and present a spherical nodule outside the nerves and chiasm but attached to them by a stalk or pedicle. The tumors have most frequently occurred in early life (under 12 years) but may occur in adult life. They may produce only the symptoms of headache, visual disturbances, optic atrophy, and visual field defects; or in addition may cause flattening of the sella turcica and clinical evidences of hypophyseal deficiency. In 6 of the 18 cases in Cushing's (20) series the condition was associated with von Recklinghausen's disease. While a diagnosis in the past usually has not been correctly made, it is certain that we shall do better now that we are more familiar with the condition; and chiefly by a better interpretation of the sellar changes and by the enlargement of the optic foramina. The treatment of the condition remains problematical. Since the primary indication for treatment is the preservation of vision, the radical removal of the tumor, if possible, seems out of the question, for it would cause the blindness one naturally wishes to prevent. It would seem at first thought that surgery has nothing to offer in the treatment of these tumors and, could an accurate diagnosis be made, they had best be left alone. I can find only a few recorded cases proved by operation in which X-ray treatments have been given; and in these there has not been any improvement in vision or checking of the loss of vision. Certain theoretical considerations suggest that we should not yet be completely discouraged regarding the treatment of these tumors. They are slow growing. My first case lived 4 years after the operative demonstration of an advanced tumor before vision was completely lost. My second case is living 1½ years after operation with vision actually (and unaccountably) improved. One of Cushing's cases lived 7 years after operation, his vision being stationary for this period. In all carefully recorded cases, visual disturbances have at first been unilateral and only subsequently has bilateral involvement occurred. In the majority of cases when first seen by the neurologic surgeon there was blindness in one eye, impairment of vision in the other. These observations suggest that the lesion is at first unilateral and if this be so, surgery might have something to offer (Fig. 38). We need very much a series of accurate perimetric examinations in the very early stages of the condition; for we could thereby gain a better idea of the starting point of the lesion. Again there is the possibility that longitudinal incisions through the sheaths of the nerves and chiasm (neuroschizis) might improve vision temporarily; for because of the long duration of the

condition and an occasional autopsy description of nerve fibers widely separated by tumor tissue we get the suggestion that the nerve fibers are for a long time compressed rather than actually destroyed. Whether the release of the tumor from its enveloping sheath would cause the more rapid growth of the tumor into the surroundings and do more harm than good is problematical.

10. *Gliomata arising about the infundibulum.* In a personal series of 45 successive lesions about the chiasm exposed by an intracranial approach 5 (11 per cent) were found to be gliomata arising about the infundibulum or third ventricle. Martin and Cushing (68), in 1923, reported 233 lesions about the chiasm, 6 (2.5 per cent) of which were gliomata arising in this neighborhood. It is probable that the high percentage of cases seen by me is unusual. Our pathological diagnoses can scarcely be at fault. Three of the tumors were solid and fragments were removed for microscopic section; two were partly cystic and the fluid was the typical yellowish fluid which promptly clotted. They clearly could be differentiated from other suprasellar lesions which we have seen at the operating table. They differ in their symptomatology from the other groups of tumors we have been discussing in that they more early produce a choked disc due to increased intracranial pressure, the result of occlusion of the third ventricle. Yet we know little of their early symptomatology for all the cases which have come under our observation have been late cases with either a choked disc with optic atrophy or an optic atrophy clearly secondary to a choked disc. They come under discussion here because they may be confused with the late stages of the various lesions we have previously discussed. They present the symptoms of headache, disturbances of vision, visual field defects, an enlarged or partially destroyed sella turcica, signs of hypopituitarism and ophthalmological changes which may be of the nature of a secondary atrophy or a choked disc with atrophy. In 2 cases we first confused the lesion with a cerebellar tumor. Their treatment is at present unsatisfactory. In one of our cases calcification of the large tumor occurred and the patient, when last heard from, was well, although completely blind, 10 years after the exposure and verification of the lesion. In another case X-ray treatments had for a few months a remarkable effect; the headaches disappeared, the vision improved, and the patient appeared well. There was, however, an immediate recurrence of these symptoms which were unaffected by subsequent X-ray treatments.

11. *Cholesteatomata, dermoids, and teratomata.* These are rare tumors in the chiasmal region and we have not yet encountered any of them. Cushing (20) in 186 osteoplastic transfrontal explorations of the chiasmal region found 1 cholesteatoma; in 219 cases of verified tumor producing symptoms of dyspituitarism he (17) found 4 teratomata and 1 cholesteatoma. They are included only for the sake of completeness. In view of their rarity it is unlikely that, for the present, they will be correctly diagnosed. They present the symptoms of suprasellar tumors. Their treatment is surgical removal if possible.

12. *Suprasellar and parasellar aneurisms.* Intracranial aneurisms are not so uncommon as formerly supposed. Those which arise about the chiasm and may therefore implicate it and the optic nerves are chiefly the aneurisms of the internal carotid, of the anterior cerebral, and of the anterior and posterior communicating arteries. These comprised 53 or 34 per cent of the 154 cases of aneurism of the basal arteries of the brain collected by Gowers. A discussion of these lesions and their varied symptomatology need not be entered into here. Of interest in our present discussion is that they may cause visual disturbances, bitemporal or other visual field defects, destruction or not of the sella turcica, ocular palsies, anosmia, and mental disturbances, unilateral optic atrophy and contralateral choked disc, etc. They may, then, simulate in their clinical manifestations the hypophyseal tumors, the suprasellar tumors, and the olfactory groove tumors (20). Of especial interest is the small group of suprasellar aneurisms (15) described by Cushing (20), three of which were exposed and verified at operation (Fig. 39). They presented the clinical findings of visual disturbances, primary optic atrophy and bitemporal field defects with little or no changes in the sella turcica—a group of symptoms designated by Cushing "the chiasmal syndrome" common to many of the lesions we have been discussing. It becomes, then, of importance to recognize the aneurisms about the chiasm, if possible, before operation and certainly at the operating table; for the failure to do so in the latter instance may well lead to a serious and embarrassing situation. Their recognition before operation so far as I can gather rests more upon an accurate history—the history of sudden and perhaps repeated attacks of agonizing headaches, of temporary loss of consciousness, and bloody cerebrospinal fluid—than upon any specific clinical findings. These are symptoms, not of the lesion itself, but of periodic leakage from a small rupture. In their absence, a

pre-operative diagnosis may be impossible (Cushing's 3 cases). A subjective or objective bruit is usually absent. Concentric lamellæ of calcification, as in one of our cases, may suggest the correct diagnosis. Pfingst and Spurling emphasize the frequent association of ocular palsies as more or less significant. Their treatment, if an accurate diagnosis can be made, may, for the moment, be considered non-surgical. I cannot find a recorded case in which, after the unexpected exposure of one of these aneurisms, a serious effort has been made to attack it by any of the methods used elsewhere in the cure of this disease. To the surgeon who has been confronted with one this is readily understandable; and yet it might be quite possible to cure the small median subchiasmal aneurism through the induction of clotting within its wall. No doubt this effort will sooner or later be made.

13. *Chronic cisternal arachnoiditis.* At least one condition, other than tumors, may give rise like them to visual disturbances of varying severity, primary optic atrophy, and visual field defects which may be of the nature of a bitemporal hemianopsia but need not necessarily be so. The sella turcica is normal. For want of a better term the condition has been called chronic cisternal arachnoiditis. As was noted in preceding pages the space between the optic chiasm above and the sellar diaphragm below is occupied by the cisterna chiasmatis. In the condition which we are discussing the walls of this cistern are thickened and fluid collects within them under sufficient pressure to cause compression of the chiasm with resulting bitemporal field aspects. This is undoubtedly one condition seen at operation; but in addition to this there is apparently a condition of similar nature but without excessive distention of the chiasmal cistern manifested chiefly by a thickening of the pia arachnoid around the optic nerves at their junction with the chiasm and extending forward to the optic foramina. The nerves seem embedded in, and strangulated by, a mass of adhesions as is seen sometimes in arachnoiditis involving the spinal cord. Under these circumstances there is, instead of bitemporal field defects, a more or less concentric constriction of the fields of vision. That I should have exposed these conditions 4 times in a recent series of 17 successive explorations of the chiasmal region would suggest that the condition of chronic chiasmal arachnoiditis is more common than has generally been supposed. Cushing, in several articles on the "chiasmal syndrome" refers to it and in one (20) reports a case operated upon for the symptoms of progressive loss of vision, optic atrophy, and bitemporal field defects. At operation the chiasm was found enveloped in a thickened and grayish arachnoid containing a great excess of fluid. There was no improvement in vision following the operation. Aside from this report—which Cushing states has not been his only experience—I fail to find any very definite references to the operative treatment of this condition. Of the 4 cases in my series all showed marked loss of vision (one blind) associated with a primary optic atrophy (one showed slight papillœdema). In 2 there were obvious temporal field defects, in 2 a more or less concentric constriction of the fields of vision. In all, the sella turcica was normal. In 3 there were no clinical evidences of hypopituitarism, in 1 outspoken signs of hypophyseal deficiency. At operation a chronic cisternal arachnoiditis with adhesions about the optic nerves was the evident condition. In 3 of the 4 cases, there was in addition to the condition about the chiasm, a thickening of the pia arachnoid with an excess of cerebrospinal fluid over the frontal and temporal lobes exposed in our approach to the chiasm; so that the chronic cisternal arachnoiditis appeared to be but a part of a more or less general condition. Following operation there has been a remarkable improvement in the vision of all 4 patients. One, however, has been so recently operated upon that statements regarding the late results cannot yet be made. Of the 3, 1 has satisfactory vision and is following his usual work 3 years after operation without as yet any signs of recurrence of the condition; 1 has satisfactory vision (can read the finest print) and is doing her usual work as a nurse 1 year after operation; and 1 (previously completely blind) can, with glasses, read the finest print and is without symptoms of a recurrence of the condition 6 months after operation. Thus far, then, our experience with the surgical treatment of this condition has been quite satisfactory. The cases will be detailed at greater length in a subsequent report.

SUMMARY

1. The intracranial approach to lesions about the chiasm has become the operation of choice and has largely supplanted the transphenoidal approach even for tumors and cysts arising within the sella turcica.

2. Largely through a more consistent use of this approach, a whole series of lesions about the chiasm, unsuspected 20 years ago, has come within the knowledge of the neurologic surgeon, and their symptomatology, clinical signs, and X-ray manifestations have come to be better

understood. The ophthalmologist should make himself familiar with these lesions for to him perhaps the majority of patients harboring them first come.

3. The treatment of many of these lesions remains problematical. It becomes evident that progress in their treatment would be facilitated if reports of the treatment of lesions about the chiasm were made with particular reference to the pathology of the lesions treated. At the present time it is often difficult from the reports in the literature to get any accurate idea of the results of the treatment of lesions about the chiasm.

4. The X-ray has been a distinct contribution to the treatment of the hypophyseal adenomata, both chromophil and chromophobe. In certain cases it may check the growth of the tumor and delay or make unnecessary its operative partial removal. It is a valuable adjunct and should in our opinion be used routinely in the postoperative treatment of these tumors. It is possible that the improvement in the results of the operative treatment of hypophyseal adenomata, attributed in part by us to the more logical removal of that portion of the tumor directly compressing the chiasm and nerves, may in greater part be due to more frequent use of postoperative X-ray treatments. The use of this method is not without danger. Its use as an alternative to surgery presupposes accurate pathological diagnosis for, so far as our present knowledge goes, the hypophyseal adenomata alone of the many lesions about the chiasm respond to it. Its indiscriminate use in lesions about the chiasm may do great harm; and it should in our opinion be given only with the knowledge and consent of those familiar with these lesions.

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FROM THE UNIVERSITY OF CALIFORNIA HOSPITAL

STEPS TOWARD STANDARDIZATION OF PERINEAL PROSTATECTOMY

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NO recognized surgical procedure shows more modifications and improvements during the last few years than perineal prostatectomy. The anatomical principles of approach and exposure as first presented by Hugh H. Young remain fundamental and will always do so if protection of the rectum and the muscles of micturition are to be secure. The perineal operator must know in all its complex details the anatomy of the male perineum. The topography of the region in relation to perineal prostatectomy was recently presented.[1] Since then certain modifications of method have proved so satisfactory that it seems appropriate to present them as an appendix of the method of procedure then in use. Not all are by any means original but have been developed in routine practice with associates as a group.[2] The operation as described in 1929 is transitional.

Modifications of Young's original technique have as objectives more complete visual *en masse* enucleation, complete hæmostasis, and an approach to primary healing with shortened hospitalization. *En masse* enucleation per perineum has raised the question of postoperative stricture; suture and closure without packing or perineal drainage tube, for purpose of primary healing, that of secondary hæmorrhage and infection. These objections have been overcome satisfactorily but not to the point of considering the procedures used to do so as standardized or entirely perfect. Certain steps necessarily will change with the advance toward perfection of allied surgical procedures. The distinct and solid gains of the last few years in the surgical care of the prostatic, tending to make an already benign operation safer, and to give better results in every way, are worthy of discussion.

The problem of prostatectomy falls under four headings: (1) preparation, (2) anæsthetic, (3) surgical technique, and (4) postoperative care.

[1] Perineal prostatectomy. Surg., Gynec. & Obst., 1929, xlix, 669–681.

[2] Indebtedness to the frank criticism of associates and assistants for improvement in personal methods of doing things is recognized by all surgeons. Some time ago I sent to former assistants a questionnaire on prostatectomy. I wish to acknowledge as particularly appreciated the answers of Duncan M. Morison, of Edinburgh; Clark M. Johnson and Thomas E. Gibson, of San Francisco; A. B. Hepler, of Seattle; and A. Elmer Belt, of Los Angeles. Gibson has himself written on improvements in perineal prostatectomy and emphasized the possibilities of hæmostasis and primary healing, and the others all practice improvement. Belt has a good motion picture of the operation.

PREPARATION

The virtue of proper preparation for operation of every patient with an enlarged prostate is not universally recognized even by urogenitologists. It should be. Why subject a man in excellent health with a large prostate but small residual that is free of infection to an arduous week or 10 days of catheter preparation? Why should a man who cannot be catheterized but whose bladder is not palpable not be operated on at once? The answer requires a detailed discussion of urinary sepsis, of the physiology of micturition, of antiperistalsis of the seminal tract, and references to these aspects of the problem need be sent only to the inexperienced. Every case should receive prolonged catheter or cystostomy preparation for the simple reason—it is safer. This holds for whatever type of operation. But for perineal prostatectomy, after which a urethral catheter is worn, it is particularly important. Catheter preparation is preferred to cystostomy always for this reason. Optimum success in the operation as now done is secured largely by the man being able comfortably to wear a urethral catheter 5 to 7 days after operation. For this reason occasionally suprapubic enucleation is preferable when cystostomy has been required. But it is surprising with the proper trained assistance in the care of a retention catheter how seldom cystostomy is indicated—twice in 3 years in my experience.

Formerly the greatest burden of retention catheter was intercurrent epididymitis. Early bilateral vasoligation largely prevents this. Rarely a man gets an ascending funiculitis, recognized as a tender cord running from the point of ligation through the inguinal ring, which never gives as high a temperature or lasts as long as epididymitis. An associated seminal vesiculitis should be looked for and treated. It is in such cases when recognized before operation that radical prostatectomy with seminal vesiculectomy may be indicated.

SIMPLE TECHNIQUE OF VASA LIGATION

A simple and at the same time efficient technique of vasa ligation is with curved needles (No. 14). The scrotal skin with the vas is grasped firmly in the left hand so that the vas lies in the groove (made by pushing the thumb against the first and second fingers of the same hand)

between the first and second fingers on the skin surface behind and the thumb on the skin surface above, thus preventing its slipping away. The skin and subcutaneous tissue with the vas are anæsthetized locally on whichever surface is more convenient. A curved needle is passed in and out of the upper or lower skin layer, just beneath the vas and at right angles to it, the needle's passage being easily guided by the sense of touch of fingers and thumb holding the vas. Hæmostats to the same side on the needle at base and tip make of it a retractor to lift the vas which now lies just beneath the skin surface in the curve of the needle. A short incision over the belly of the needle exposes the vas which can be felt to roll beneath the finger on the needle. A second curved needle can be used to lift the vas out of this bed, freed of its capsule. It is then doubly ligated and divided.

ANÆSTHESIA

Spinal anæsthesia has become popular and is ideal for the operation of prostatectomy. Respiratory complications are practically eliminated with its use. The fall in blood pressure is sometimes serious. Labat's rule of keeping the head low continuously should be rigidly followed. Spinal is much quicker, easier on the patient, and, for this reason, usually more satisfactory to the surgeon than sacral and paravertebral block. When anæsthesia fails with the latter, gas and oxygen are required. All things considered, spinal anæsthesia when not contra-indicated is comparatively safe, but sacral anæsthesia is safer in the long run of cases, even when many of these will require gas. Recently we have used local infiltration anæsthesia successfully, doing a complete operation with bladder discomfort and fullness as the only complaint of the patient. We are inclined to regard sacral with local infiltration when needed as much safer than spinal anæsthesia.

OPERATION

The minor modifications of method pertain to exposure, enucleation, hæmostasis, retention catheter, and closure.

It is unnecessary in every case to *expose* the posterior prostatic surface widely by complete division of recto-urethralis muscles. With the long urethral tractor of Young, first advocated for use in seminal vesiculectomy (Geraghty's or Crowell's tractors are preferred by some), the prostate is lifted into the field, and, after division of conjoined tendon and a few of the more superficial recto-urethral fibers, is palpable. The bulb need not be freed nor lifted to expose the membranous urethra. The anatomical relation of transversus perinei on each side to the central point of perineum under the bulb is better left undisturbed. Little use is made of anterior traction. The sense of finger touch localizes definitely the central point of the perineum by feeling the shaft of the tractor in the urethra just below (above—on operating table) the prostatic apex and the line of rectal reflection on the bulging prostate beneath is known to be near this in the midline. Division of all these tissues to free the rectum is only occasionally necessary (in cancer or when radical removal is in mind). The edge of the right levator ani is stripped down from where it hugs the right lateral surface of the prostate beneath. Holding it down with the left index finger, the loose tissues covering the prostate are divided by cutting down on the right lateral prostatic surface below the apex as presented to the operator until the glistening membrane of Denonvillier is reached. The right lateral surface can at once be readily exposed by blunt dissection. Working toward the midline and opposite side from the patient's right to left, it is usually possible to obtain quite satisfactory exposure for enucleation without complete division of rectal attachments by pushing these over to the left, carrying the rectum along. (A left handed operator would prefer working from patient's left to right.)

En masse enucleation is not imperative. Quite as good results may follow segmental removal. But freeing the enlargement in one piece has advantages for thoroughness and better surgical repair. The peculiar nature of prostatic enlargement is significant here. Prostatic hyperplasia affects periurethral glands, not true prostatic glands. These latter are pushed away from the neck carrying ejaculatory ducts and are all compressed together posteriorly to form the false capsule of the enlargement. Preservation of ejaculatory ducts, in view of almost universal duct ligation preparatory to operation, is no longer matter of concern.

The enlargement has no real relation to the true prostatic lobes. A (middle) commissural lobe enlargement, a lateral lobe enlargement, an anterior lobe enlargement do not mean hyperplasia of the anatomically recognized middle, lateral, or anterior lobes. That is why the posterior lobe has never been known to hypertrophy. In this sense none of the others do either. But any one of the six lobes may undergo malignant changes. Hyperplasia arises from groups of small glands, sometimes anterior, in the majority lateral and posterior, between the region of

verumontanum and neck, closely related to and surrounding the urethra. Their relation to the commissural group of Randall, the subcervical group of Albarran, and the subtrigonal group of Home is uncertain. Hyperplasia of these periurethral glands, except the Albarran and Home, pushes the true lobes away from the bladder, elongates the urethra, and may produce intravesical projections which are never pedunculated. Structurally, the anterior lobe is chiefly smooth muscle, glandular tissue being insignificant, and that is why there is such a thin false capsule anteriorly as compared to the one posteriorly after enucleation of enlargement. Prostatic enlargements of size therefore actually separate the prostate proper with the verumontanum and external sphincter from the vesical neck. The fibers of the trigone described as passing over the sphincter to attach near the verumontanum must be separated therefrom by such enlargements and the mechanism of internal sphincter relaxation cannot be satisfactorily referred to this pull. Micturition is quite normal after prostatectomy which has destroyed the attachment. Enucleation therefore removes a periurethral growth distinct from the prostate proper, which itself has been pushed posteriorly and compressed by it. Randall finds the subcervical group hyperplasias always pedunculated and intravesical and for this reason advises the suprapubic route. But they are quite easily removed perineally even when practically the only enlargement. I have once found such a pedunculated growth, antero-left lateral, which was easily removed with its entire mucous covering through the internal sphincter perineally. A complete cystoscopic diagnosis of the type of hyperplasia present is always necessary if one chooses the perineal approach; otherwise these rare pedunculated growths might easily be overlooked.

A wide crescentic incision of this compressed prostate or false capsule permits thorough freeing of the hyperplasia at the neck, separation and preservation of the encircling internal vesical sphincter fibers, division of the urethral mucosa below the external sphincter, and radical removal of this unit growth with that portion of redundant mucosa belonging to it. Such *en masse* removal does not predispose to stricture provided repair of the distorted relations is surgical and not left to haphazard restitution by packing the cavity left behind with rolls on rolls of gauze as most of us did formerly. Even then stricture was extremely uncommon but instrumentation was later sometimes difficult or impossible because of urethral distortions of such unsurgical restitutions.

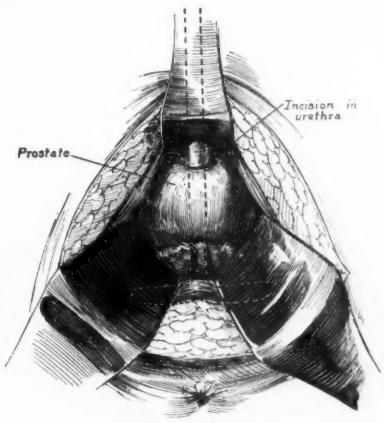

Fig. 1. Incision of the urethra at the apex of the prostate. A short incision into the mid portion of the levator muscle layer on each side permits wider retraction with two deep posterior retractors instead of one, thus giving better exposure. The seminal vesicle tractor shown diagrammatically with blades open in the bladder (placed too low in the figure) lifts the prostate into the field. Portions of seminal vesicles are seen at the base of the prostate.

Hæmostasis is of immediate importance, structural repair, of later though, equal, if not more importance. The two benefit by joint consideration. The anatomical situation after enucleation by way of the perineum through the crescentic incision of the posterior prostatic surface is the large cavity previously occupied by the periurethral hyperplastic mass. This ragged cavity is bounded vesically by the orifice of the bladder with its more or less dilated sphincter and its ragged mucosal edge which is completely separated from the urethra, anteriorly, by the insignificant thin anterior capsule and muscles denuded of mucosa, posteriorly and laterally, by the thicker false capsule of compressed true prostatic tissue carrying ejaculatory ducts, which by reason of earlier incision presents lateral lamellæ and a central flap, but also denuded of mucosa, and urethrally, by the completely divided urethra held in relation to the cavity by the lateral lamellæ of the false capsule. The major hæmorrhage is seen to be at the bladder neck posteriorly and laterally. Mattress sutures, one on either side, entering the lateral lamella at the farthest possible point to the side, piercing the sphincter and mucosa of the neck at the corresponding octant, and coming back through both 1 centimeter below, effectually control bleeding as a rule, and eliminate the dead space of the cavity

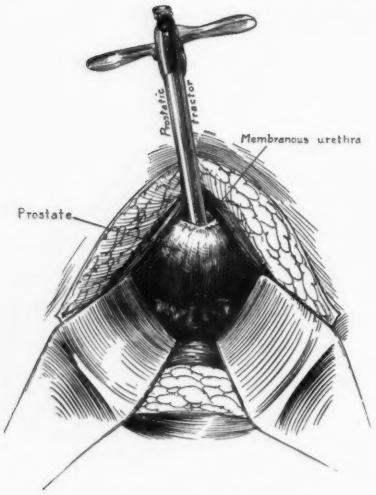

Fig. 2. Placement of short prostatic tractor for direct traction.

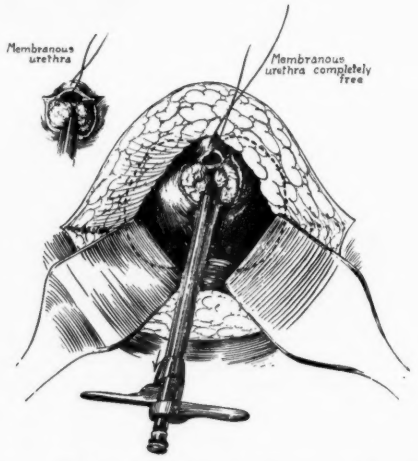

Fig. 3. Division of urethra at apex of prostate. Anatomical relations at central point of perineum are left undisturbed, except that the recto-urethralis has been previously divided along the rectal wall. Blunt dissection of the anterior prostatic surface *extracapsularly* down to the bladder neck readily located by the open blades of the prostatic tractor in the bladder is the next step.

laterally and posteriorly. The flap layer of the false capsule is sutured into place after placement of a urethral catheter.

A *urethral catheter* is placed for the purpose of urethral restoration, as after resections of the bulbo-membranous urethra for stricture, and is retained as a rule 5 to 7 days. It is always removed on the seventh day and the urethra is thoroughly irrigated once or twice for a few days. Should there then be urinary leakage through the perineum it is sometimes replaced for 3 to 4 days or so until the perineum remains dry without it. Wildbolz has recently advocated suturing the vesical neck to the urethra, as described below in radical prostatectomy, in his partial prostatectomy operation (Fig. 5).

The flap of compressed prostate is next sutured into proper relation with the lateral lamellæ by tight *closure* and the recto-urethralis fibers previously pushed aside are now drawn back in place over it. Suture of levator ani completes the closure. No packing is used.

Infection. Complete closure increases the danger of postoperative infection. Dependent drainage has been the advantage of the perineal route. Can we deliberately cast it aside? An antiseptic solution in the bladder, such as permanganate of potash or mercurosol, and thorough irrigation of the operative field during the course of the operation and before closure are not always sufficient. Occasionally abscesses form in the closed tissues. We are now working on a system of capillary tubes after the Carrel method in wounds so that the field can be percolated with Dakin's or similar fluid for a few days after operation.

RADICAL OPERATION

Occasionally men come for operation who have long suffered with urinary sepsis, prostatitis, and vesiculitis. Their enlargement is a late complication. Simple removal of the enlargement fails to give them as much relief as it should. Frequency and burning may continue and pyuria be constant but with no residual. Pyelonephritis, lithiasis, vesical diverticulum, etc., are often responsible for such seeming failures of prostatectomy but a not infrequent one easily corrected if recognized at the time of operation is seminal vesiculitis.

In those cases that have had a free exposure of the prostatic surface when of size one is impressed by the relatively thin layer of compressed prostate left after enucleation of the hyperplastic mass. It is so thin and broad as to appear antagonistic to good restoration of the urethra. There is nothing left anteriorly, and only a broad posterior thin layer containing ejaculatory ducts —unnecessary after vasa ligature. The whole false capsule might easily be sacrificed. Structural

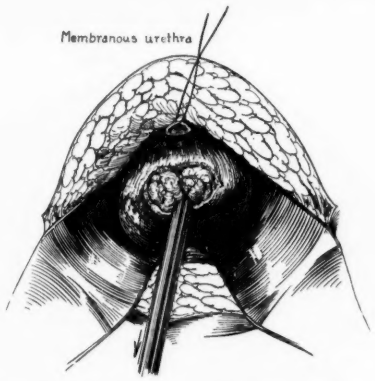

Fig. 4. Extracapsular enucleation is completed. Very little bleeding is encountered, less than usually follows intracapsular enucleation of a hyperplastic mass. Usually the vesical mucosa can be broken through anteriorly inside the sphincter with a finger or incised. Through this opening the short tractor or a spoon tractor is inserted to define the vesical neck, from which the prostate is now carefully dissected. The seminal vesicles are then freed by blunt dissection, the vasa isolated, ligated, and divided, and the whole prostate, both vesicles and ampullæ, come away in one piece. (See Fig. 7.)

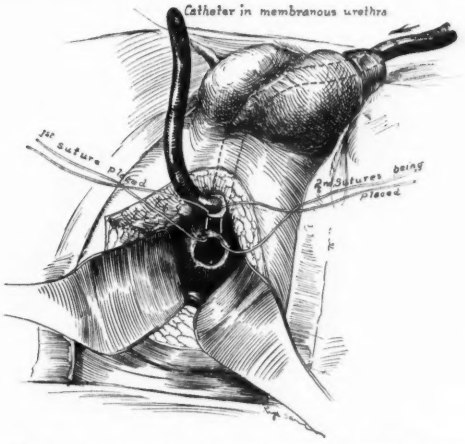

Fig. 5. Anastomosis of vesical neck to membranous urethra. After these deeper sutures are placed the urethral catheter is turned into the bladder and 3 to 5 other sutures complete the anastomosis.

restoration would not be endangered thereby. Sphincter preservation would be identical.

With this in mind, five radical prostato-seminal vesiculectomies have been done for hyperplasia complicated with chronic vesiculitis and the results have been entirely satisfactory so far as control and postoperative course are concerned.

The vesical neck is sutured to the membranous urethra by two anterior and two or more posterior sutures and the denuded prostatic space is thereby completely eradicated as shown in the accompanying illustrations (Figs. 1 to 5).

POSTOPERATIVE CARE

A detailed discussion of postoperative care is not intended. Methods of catheter care—as to type, how and when to irrigate, with what, and the period of changing; of urethral hygiene; when to empty periodically or drain continuously; when to apply suction or "continuous irrigation," etc.,—are extremely important if the catheter is to function for 5 to 7 days or longer. What follows about *secondary hæmorrhage* has not been seen mentioned, yet the simple procedure has proved of great value on three occasions.

Secondary or postoperative hæmorrhage may occur from the third to the fourteenth day. It amounts to little after that. The seriousness of the complication is not loss of blood so much as retention because the bladder fills with blood clots. Rarely can they be satisfactorily aspirated through the catheter, not even the Coudé. Patients cannot stand repeated cleansing of the bladder with a metal instrument such as a clot evacuator. Besides, if such procedure has to be repeated, it means too much loss of blood as indicated by falling blood pressure and shock. Formerly with open perineum it was quite simple to repack, but with perineum tightly closed it is not so simple. Now after one or two aspirations of clots, according to circumstances, we stop such secondary bleeding, which is found usually to come from the vesical neck, by fulguration of the bleeding points through a McCarthy urethro-

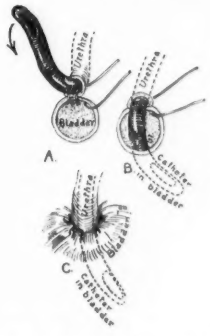

Fig. 6. Sketches showing method of inserting urethral catheter.

Fig. 7. Photograph of gross specimen after radical removal.

scope. Only thrice has this been indicated, but each time was effective.

To conclude the discussion of after care, should be mentioned a procedure, the value of which at times is not sufficiently recognized. Occasionally a rather *acute pyelonephritis* complicates a prostatic's convalescence, starting frequently coincidentally with establishment of voluntary micturition. Should a high temperature and leucocytosis persist more than 3 or 4 days, ureteral catheters should be placed and retained a few days, being irrigated every 2 hours (mercurochrome alternating with salt solution). It is a matter of surprise and satisfaction to see the temperature promptly reach normal in most of these cases under such management.

RESULTS

It is not intended to give detailed analysis of cases. Procedures are still being modified. No standard method has been reached. Not all cases, even of the last few months, have had complete closure. But this undoubtedly is the right objective. It shortens hospitalization. Cases which have had primary healing may now go home any time after the eighth day. If they go within 2 weeks it is a surgical triumph. Formerly the prime consideration was mortality. It is still so. But when the mortality of a major operation falls as low as that of perineal prostatectomy, less than 3 per cent for all types of cases, major consideration becomes improvement of convalescence and results. Better methods of preparation, better anæsthesia and better methods of postoperative care must share with an operation that gives better healing and function (complete hæmostasis) further reduction of this already low mortality rate.

THE SURGICAL TREATMENT AND MANAGEMENT OF PHARYNGO-ŒSOPHAGEAL DIVERTICULUM

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MY purpose in presenting this article is to review the interesting phases of the evolution of the two-stage operation, to outline a detailed plan of surgical management, and to report a typical case of pharyngo-œsophageal diverticulum. Only the pharyngo-œsophageal pulsion diverticulum (Zenker) will be considered.

These diverticula arise from the posterior wall of the œsophagus at the lower end of the pharynx on a line with the cricoid cartilage. It is a herniation of the mucous membrane and submucosa of the œsophagus, through a weak point known as the "Lainer-Hackermann point" near the junction of the inferior constrictor muscle and the longitudinal muscular bands of the œsophagus.

Dr. Chevalier Jackson calls attention to an inco-ordination of the cricopharyngeus muscle, in which the muscle fibers pull in opposite directions and create the weak spot through which the protrusion occurs. This weak spot is between the pars obliqua and the pars fundiformis of the cricopharyngeus muscle (the inferior constrictor of the pharynx). Continued mechanical pressure at this bulging point gradually increases the size of the sac until it produces symptoms. The sacs vary in size from that of a pea to a large pear. During deglutition, pressure distends the posterior wall.

It occurs more frequently in men than in women (about 4 to 1). The usual ages reported are from 42 to 80 years, averaging between 50 and 60 years, in individuals who are more prone to other hernias and in those who show a congenital tendency toward diverticula elsewhere.

Surgical treatment giving satisfactory results began about 25 years ago. Previous to this, the mortality ranged from 16 to 23 per cent.

HISTORICAL DATA ON THE SURGICAL TREATMENT

Wheeler, of Dublin, in 1886, reported a case cured by the surgical removal of œsophageal diverticulum. Von Bergman and Theodore Kocher reported other successful removals of diverticula in 1892. Girard, of Berne, 1886, reported 2 cases in which he invaginated the pouch into the œsophagus and sutured the external aspect of its neck with three layers of sutures. No obstruction resulted. A. E. Halstead, of Chicago, treated a case in 1904 by a similar method; he invaginated the sac, applied a purse-string suture around the neck, and covered this with three rows of sutures in the œsophagus. Their idea was to avoid opening the pouch or the œsophagus. Halstead pointed out that this method was adapted only to diverticula of small size.

This technique was improved and modified by Bevan, who reported the Sippy-Bevan operation in 1917. A series of longitudinal and circular pursestring sutures were inserted in the wall of the sac. The tying of these obliterated the pouch.

Halstead (4) developed a two-stage operation which he practiced for a number of years, but as far as I know, did not report it until 1919. The first stage consisted of the isolation of the sac, twisting it on itself transversely and suturing it to the upper end of the wound. The second stage was done 10 to 12 days later when the wound was re-opened and the sac removed by cautery. A pursestring suture was applied around the neck of the sac, the stump was invaginated into the œsophagus, and the longitudinal fibers sutured over it.

Goldmann recorded 2 successful cases operated upon by the two-stage method in 1907. He isolated the sac as in primary excision, but instead of cutting off the pouch, turned it upward and sutured the fundus to the upper angle of the wound. Later he modified this technique by constricting the sac lightly with catgut; the skin then being sutured except at its lower end. A second stage was done 10 days or more later, when the wound was re-opened, the pouch excised and sutured as in the one-stage operation. Goldmann also reported having ligated the neck of the sac tightly to insure strangulation and necrosis of the pouch, packing it high in the wound with gauze and only partially closing the skin, leaving it open for drainage. The second stage consisted in removal of the sloughing sac in a week or two, but leakage occurred and resulted in an unclean procedure which was not too free from risk.

When the Goldmann two-stage operation is mentioned today, it generally refers to the one in which the sac was turned up and ligated loosely, with the idea to prevent food and air from entering the pouch, yet not having it tight enough to cause strangulation and necrosis.

Wilke and Hartley modified the Goldmann operation by incising the pouch and performing a submucous resection of the mucosa which they removed, leaving the fibrinous coat that they had

invaginated and closed the opening by purse-string suture. Later, Frank H. Lahey improved this procedure by making a thorough isolation of the sac to its neck and a high implantation in the wound, suturing the sac to the skin or the parathyroid muscles if the sac was short. At the second stage, he did not attempt to remove all the walls of the sac because of the danger of re-opening the space behind the œsophagus. The neck of the sac was exposed and the sac cut off with scissors, thus exposing the submucosa, which was separated from the wall down close to where it joined the œsophagus. This mucous membrane was cut away and a strip of boric acid ointment impregnated gauze was passed into the sac canal, thus pushing some of the loose mucosa ahead of it.

C. H. Mayo, at the first stage, sewed the sac to the sternocleidomastoid muscle without ligating or twisting the sac. The second stage was done 10 days later. Judd's (7) technique consisted in freeing the sac in the usual manner, carefully separating the adhesions from the anterior wall of the sac to the posterior wall of the œsophagus up to its neck, suturing the neck of the sac to the sternocleidomastoid or platysma muscles with a few interrupted sutures, and closing the wound around the diverticulum. At the second stage, the wound was re-opened to the neck of the sac; the sac was ligated with a pursestring suture and removed without any attempt to suture over the wall of the œsophagus.

In 1923, Judd found less than 200 cases operated upon, but since then, many more have been added and it is evident that this condition is being recognized more frequently. Practically all cases that come to surgery, have been treated for several years on an erroneous diagnosis.

Beginning with 1907, to the present date, there have been published many excellent articles dealing with the two-stage operation, by Goldmann, Halstead, Murphy, Mayo, Judd, Lahey, Hill, Sturgeon, and others.

SYMPTOMS

A. Dysphagia.

B. Large amount of mucus expectoration, particularly in recumbent position.

C. Discomfort in the throat.

D. Spitting up of food, which does not appear to have been in the stomach, several hours after ingestion.

E. Loud gurgling splash on swallowing, due to mingling of swallowed air and food.

F. Regurgitation of food at the table and sometimes long after a previous meal.

G. Discomfort in swallowing, rather than difficulty in getting down ample food for nourishment.

H. Sensation of choking.

I. Pressure on the neck above clavicle, eliciting succussion splash as contents of sac are ejected.

J. Obvious palpable swelling of neck, generally on left side.

K. Occasional fit of coughing and choking. Sometimes patient can eat satisfactorily only while in recumbent position. Liquid and soft food swallow easier than hard food such as rice, raw apples, beans, etc.

L. Some patients state that when they eat they can be heard all over the house, causing embarrassment.

M. Later, loss of weight; evidence of starvation.

N. Attacks of temporary stagnation of food and overdistended sac which obliterates the normal opening of the œsophagus. During these attacks patients are unable to get nourishment into the stomach.

DIAGNOSIS

The symptoms may come on very slowly, beginning with an irritable throat and excessive expectoration of mucus and later dysphagia. Many patients have complained of these disturbances for several years and have been treated for various throat disorders. I believe, under ordinary circumstances, a diverticulum of sufficient size can be diagnosed in a few minutes. It is usually the impression of these patients that they have some kind of a growth in the neck. If there is dysphagia and one's suspicions are aroused, have the patient swallow a half glass of water, then inspect the neck for visible swelling (which occurs in about 1 in 5 cases) above the clavicle, usually on the left side of the neck. If sac is present, compressing the neck will cause it to empty whether there is visible swelling or not. A gurgling sound or splash will be heard as the water regurgitates back into the throat.

Confirmation of diagnosis on this basis must be made by a roentgenological examination. If the patient is given a few ounces of barium meal, the sac will fill and be seen under the fluoroscope. By having the patient continue to drink the barium mixture after the sac is filled, it will show the meal entering the œsophagus below the sac; stricture below can usually be ruled out. Œsophagoscopy is indicated in these cases and may confirm the diagnosis of diverticulum; also may rule out stricture and neoplasm. The danger of perforation of any instrumentation, however, is great and, unless expertly done, may do much harm. Judd does not recommend œsophagoscopy as routine meas-

ure; not only because of the danger involved, but also because frequently very little information is obtained. If the roentgenological examination reveals the typical shadow produced by these sacs, there is practically no danger of error in diagnosis.

TREATMENT

Treatment should always be surgical unless the diverticula are small. These are more difficult to operate upon than the larger ones and usually do not produce marked or distressing symptoms and may be treated medically until they become larger and more troublesome. The medical management consists of dilatation of the œsophagus with olive-tipped bougies. The patient should be taught to keep the sac empty by pressure upon it or by lavage with a small catheter. The symptoms produced by large sacs might be controlled by this management if operation were contra-indicated. I know of one case which Halstead reported, that was under his observation for 24 years. The patient daily lavaged and emptied the sac which was very large, but did not obstruct the œsophagus. Operation was refused and the patient managed to keep in fairly good health.

Prognosis of pulsion diverticula is considered serious, not only from the standpoint of progression of dysphagia, pressure symptoms, and starvation, but marks the risk of perforation by sharp foreign bodies, resulting in mediastinitis and cellulitis. In a recent article Meyersburg (10) reported a traumatic mediastinitis. His patient swallowed some horseradish containing particles of glass and developed immediate pain in the throat. Roentgenogram showed a typical diverticulum and extravasation of the barium about the œsophagus.

The two-stage operation of sac isolation and excision is so satisfactory that it can be recommended in preference to all other types of surgical treatment.

SURGICAL MANAGEMENT

Preparation. The patient must be in good nutritional state at the time of operation. Blood transfusion is considered if there is a definite secondary anæmia. If there is any evidence of dehydration and starvation, forced feedings should be instituted. Formerly it was recommended that a preliminary gastrostomy be done for this feeding, but this procedure is probably never necessary at the present time, if feeding is done by use of the duodenal catheter (Levine tube). With the patient in a recumbent position, the catheter, which has been lubricated with glycerine, is passed through the left nostril. If it meets obstruction by passing into the sac, it should be withdrawn and patient made to swallow some semi-solid food. Then with the sac filled, another attempt is made while the patient is swallowing water. Passage into the œsophagus is then usually accomplished. Should this procedure fail, have the patient swallow three yards of buttonhole silk twist at night and three yards more the following morning (method of H. S. Plummer). When thread has passed into the intestines and is pulled taut, it will serve as a guide for the passage of the duodenal catheter.

After the catheter is passed into the stomach, six to eight eggnogs well sweetened and one quart of 25 per cent glucose solution should be given daily until the patient's nutritional condition is satisfactory. The catheter may or may not be left in the œsophagus for the first-stage operation, but should always be left in for the second stage.

Patients in apparently good condition should be put to bed in hospital a few days previous to operation. The day preceding the operation, an intravenous infusion of 1,000 cubic centimeters of 10 per cent glucose in Ringer's solution is given. The mouth, gums, and teeth should be well cleansed. One-half of one per cent mercurochrome solution may be used for a mouth wash; a small amount is swallowed and allowed to enter the sac after it has been washed out and cleansed of mucus and secretion. Some sedative, preferably sodium amytal, is given the night before and in the morning of the operation, in sufficient amount to have the patient quiet but co-operative.

Anæsthetic. Infiltration anæsthesia, 1 per cent novocain, after pre-operative sedative medication, is the anæsthetic of choice. The patient's co-operation is desirable when searching for the sac. Cervical block is satisfactory when it is competently administered; however, cases are reported in which painful and persistent neuritis in the neck, shoulders, and arm occasionally have followed its use. Ethylene is satisfactory if it is found necessary to use an inhalation anæsthetic.

First-stage operation. The head of the table is raised, the patient lies supine with shoulders elevated on a sandbag; the head is thrown back and to the right, thus making the neck prominent. The skin is prepared in the usual way.

The approach is generally made through the left side unless the diverticulum is proved to be more prominent on the right side; then either side may be used. Important landmarks are the thyroid and cricoid cartilages and anterior surface of the sternocleidomastoid muscle.

The incision is made on the anterior surface of the sternocleidomastoid muscle, and is about 4 inches long. It starts at the upper end of the thyroid cartilage and ends near the clavicle. This

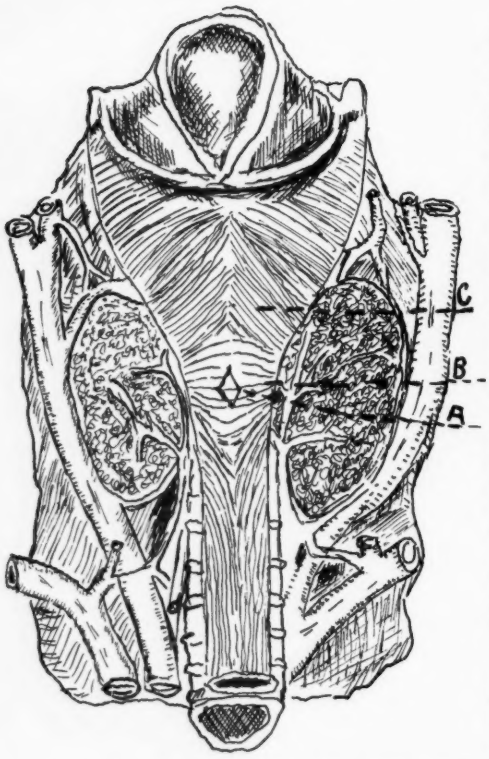

Fig. 1. Anatomical relations: *A*, Lainer-Hackermann point, site of origin; *B*, superior border of the cricoid cartilage; *C*, pars obliqua of the cricopharyngeus muscle.

incision is carried through the skin, superficial fascia, and platysma. The muscle is exposed carefully, care being taken not to traumatize the muscle fibers as this might start troublesome oozing. This operation can be done almost bloodlessly. The fascia is separated from the anterior surface of the muscle with a Kocher director and is stripped away from the inner side of the muscle, the separation being continued down in front of it to the carotid sheath. The carotid artery can be recognized by feeling its pulsation with the index finger of the left hand. The finger will serve as a guide for further dissection, will help in retraction, and will protect the vessels from injury.

Visible veins (the lateral thyroid veins) may occasionally have to be ligated if they interfere with exposure. It is best not to ligate the inferior or superior thyroid vessels; this would be quite an added hazard in case of infection; sloughing and slipping of ligatures would cause serious hæmorrhage.

The spinal accessory nerve will probably be seen high in the medial surface of the muscle and should be protected. The dissection is carried down to the inner side of the thyroid sheath, the finger still serving as a guide. The sternocleidomastoid muscle is retracted outward and the omohyoid downward. The omohyoid muscle can usually be displaced and seldom requires cutting. The sternolaryngeal muscles, the left lobe of the thyroid, and the trachea are displaced inward by retraction; the deep thyroid fascia or deep cervical fascia which forms the capsule of the thyroid gradually is blended externally with the carotid sheath. This is visualized and with the index finger of the left hand still serving as a guide, the fascia is opened with forceps, inside, close to the vessel of the carotid sheath. The wound is made larger and deeper by careful blunt dissection. By palpating with the finger at the depth of this opening, the anterior surface of the vertebral column is felt. Directly in front of the vertebra will be seen the œsophagus in the form of a red tube in the bottom of the wound. By having the patient take three or four swallows of water through a glass tube, the sac will become inflated, partially filled with air and water, and present itself in the wound.

The next step of the operation is the most difficult and important phase of the entire procedure, as Lahey and Judd have so well illustrated in recent articles. By taking hold of the fundus of the sac with the rubber protected intestinal forcep, causing traction, and with the aid of the Kuettner gauze dissector, the lower end of the sac can usually be freed quite readily.

Adhesions which are quite dense may be found between the anterior surface of the neck of sac and the posterior surface of the œsophagus. These adhesions must be separated up to the beginning of the sac without injuring the sac or the œsophagus. One can judge how high to carry this dissection by using the superior border of the cricoid cartilage as a guide. As practically all these openings begin at the level of the cricoid cartilage, one can readily be sure that his dissection is complete if the sac is free to this point. If the adhesions are easily broken down, no difficulty will be encountered, but where they are resistant and dense, it may be necessary to snip some of them with scissors. Good exposure must be established for this procedure and if found necessary, the wound may be enlarged so as to permit better visualization.

When the sac is large, gauze should be packed in the bed of the sac as it is being separated from its adhesions; this will protect the tissues from

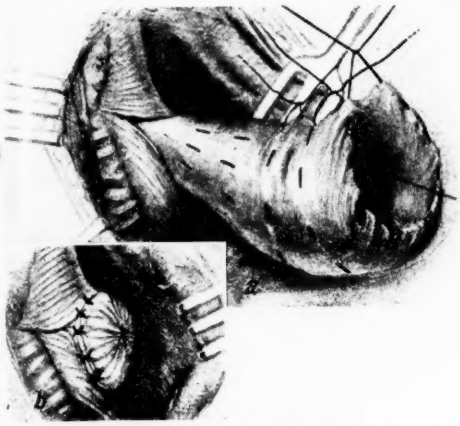

Fig. 2. Sippy-Bevan operation, infolding of sac. (From Surg. Clin., Chicago, 1917.)

infection, should the sac or œsophagus be damaged. A small leak may result in the dreaded mediastinitis. If an accident has happened, this gauze should be removed after operation is completed and replaced by iodoform gauze and the wound left open for 48 hours. The iodoform gauze may then be removed, a smaller piece inserted, and the wound closed. A large opening is left in the skin wound for drainage.

This dissection properly completed, the success of the operation is assured. There is an advantage in using the rubber protected intestinal forcep (Schoenberg's intestinal clamp, spring handle, 7¾ length) and Kuettner gauze dissector; with good retraction and light, dissection can usually be carried out successfully through a small exposure.

The sac isolated, it must be sutured in the wound high enough to change the direction of its opening in the œsophagus to prevent food and water from entering it. The neck of the sac is attached with a few interrupted sutures to the sternocleidomastoid muscle, prethyroid muscle, or skin, depending upon the size of the sac. Large ones may be marsupialized and the fascia closed with a few interrupted sutures and the skin closed with clips to the neck of the sac. If the sac is too small to be brought out through the skin, it is sutured to the prethyroid muscles (Lahey). In reopening the wound for the second stage, the sac will be more easily identified if a fine chromic catgut mattress suture is applied in the fundus, carried through the skin, and tied over a small piece of gauze (Halstead).

Trouble has been encountered following the first-stage operation with large sacs becoming

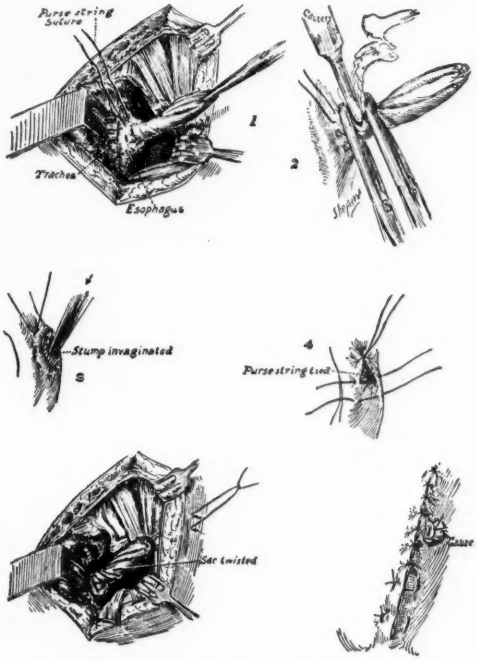

Fig. 3. Halstead two-stage operation. (From Surg. Clin., Chicago, 1919.)

gangrenous, as a result of being overdistended with air and secretions. Both the methods of Goldmann, loosely ligating sac at its neck, and that of Halstead and Murphy, twisting the sac to obliterate its lumen, have been condemned because occasionally gangrene followed. However, both of these procedures properly done, will effectively prevent this overdistention, provided they do not interfere with the circulation of the sac.

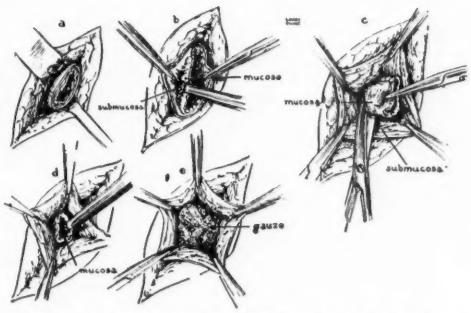

Fig. 4. Lahey, second-stage operation. (From Surg., Gynec. & Obst., August, 1930.)

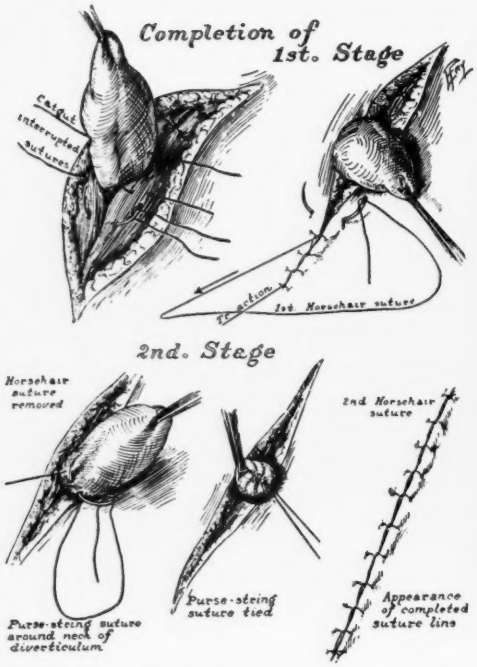

Fig. 5. Judd's two-stage operation. (From Arch. Surg., July, 1920.)

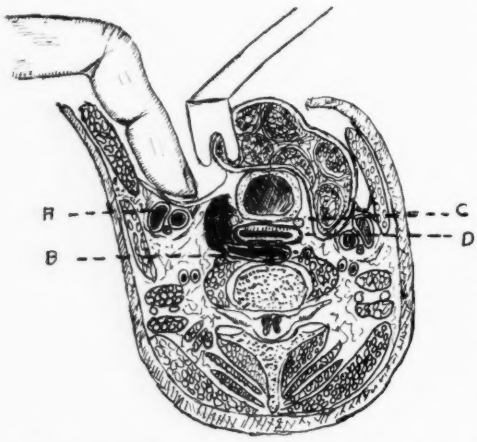

Fig. 6. Anatomical relations of the sac. *A*, Carotid sheath; *B*, opening of the sac; *C*, recurrent laryngeal nerve, right side; *D*, œsophagus.

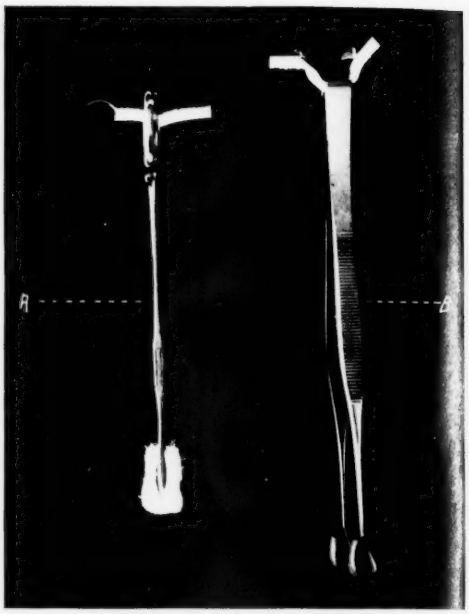

Fig. 7. *A*, Kuettner dissector; *B*, Schoenberg's intestinal clamp.

Lahey opens the fundus of the sac and sutures in a duodenal catheter; this being used for giving nourishment. This overdistention can frequently be avoided even when the sac is large if the patient tolerates the catheter well and does not swallow for a few days. The sac usually shrinks during the period between the stages of the operation.

Second-stage operation. The second stage may be done 7 days later. At this time, sufficient adhesions will have formed between the fascia planes and the loose cellular tissue in the prevertebral space; also, the cervical lymphatics will probably have been sealed, so that the mediastinum will be walled off and protected against invasion by infection, should subsequent leakage take place.

The operation will be found exceedingly simple. The wound is re-opened to the neck of the sac where it had been fixed to the muscle at the previous operation; the neck of the sac ligated with chromic catgut No. 1, tied snugly, but not too tight, and the diverticulum removed. A small piece of iodoform gauze is inserted down to the stump, the wound is closed with a few interrupted catgut sutures in the fascia and the skin with clips down to the drain. The edges of the skin that surround the sac after the first stage should be freshened up to insure good healing at this place.

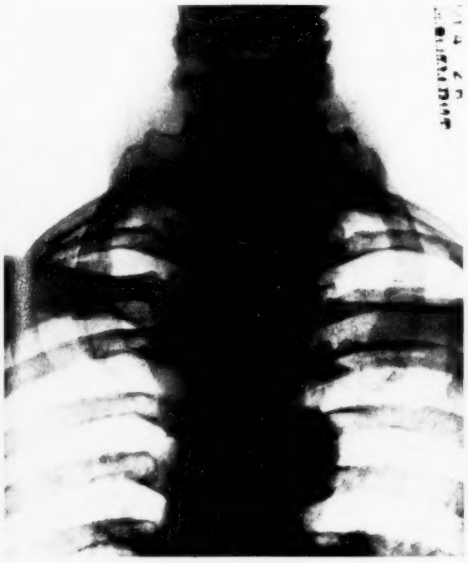

Fig. 8. Roentgenogram, anterior view.

Fig. 9. Roentgenogram, lateral view.

A large number of these cases will have some drainage of swallowed fluid in from 3 to 6 days; however, this drainage should not cause discouragement as the sinus will usually heal in a short time.

AFTER TREATMENT

The catheter should always be inserted before the second stage of the operation is performed and left in about 5 days. Forty-eight hours after the operation it may be withdrawn after the last feeding of the day and reinserted again in the morning. The patient is again warned against swallowing. If there is marked discomfort, sodium amytal or other sedative may be administered. The patient is permitted to swallow some liquids after 4 or 5 days, and the wound is observed to see whether or not there is any leakage. If there is none, a liquid diet is given. If leakage occurs, the catheter is reinserted during the day and feedings given for 3 or 4 days more; by this time the drainage has usually stopped or is very slight.

The wound is dressed daily. The iodoform gauze that had been inserted down to the œsophagus is removed and a fresh drain of iodoform gauze is replaced until food is swallowed without leakage; then, the wound is permitted to heal.

REPORT OF TYPICAL CASE

H. E. M., aged 54 years, male. The family history was irrelevant. Patient had had pneumonia twice but no other illness. For 10 years patient has had difficulty in swallowing food. This dysphagia gradually became worse. Three weeks ago, he was unable to swallow at all for several days and since then has been able to get down only thin liquids. He has had soreness in his throat for years. This soreness became quite acute since his inability to swallow a few weeks ago. In the morning he would frequently cough up food that had been eaten the night before which did not appear to have been in the stomach: he also complained of the sensation of a lump in his neck. Treatment had been given for throat trouble. He was embarrassed when eating in company and generally arranged to eat alone. People in an adjoining room could hear the gurgling noise in his throat when he swallowed. There had been a loss of 20 pounds in weight in the last 6 months.

Physical examination disclosed no visible lump in his neck after swallowing food or liquids, but by applying pressure on the neck above the clavicle, a succussion splash was heard when swallowed air and food was expelled back into the throat.

A barium meal was administered and patient examined under the fluoroscope. A typical pulsion diverticulum shadow was found. By applying pressure on the neck while under the fluoroscope, the sac was emptied and the barium meal regurgitated back into the throat. The sac appeared to be about the size of a hen's egg. More barium was given and the sac was seen to fill; after filling, swallowed barium could be seen to trickle down past the sac into the œsophagus. Roentgenoscopy did not give evidence of stricture or other pathology in the œsophagus below the diverticulum.

Diagnosis: pharyngo-œsophageal diverticulum.

Patient was admitted to hospital November 11, 1930. On admission, urinalysis was negative, but blood count and hæmoglobin were normal. Intravenous infusion of 1,000 cubic centimeters of 10 per cent glucose was given. An attempt was made to pass the duodenal catheter through

Fig. 10. Fig. 11. Fig. 12.

Fig. 10. Photograph 3 days after first-stage operation, showing diverticulum in the skin wound.

Fig. 11. Photograph 3 days after second-stage operation. The skin clips have just been removed.

Fig. 12. Photograph 19 days after first-stage operation. The wound is healed.

the nose. It stopped in the sac the first attempt, but by having the patient fill the sac with semisolid food and placing him in a recumbent position, it was possible successfully to pass the catheter into the œsophagus beyond the diverticulum. Feedings were given as follows: 1,000 cubic centimeters of 25 per cent glucose and eight glasses of eggnog 8 ounces each, daily, for 2 days previous to operation.

On November 14, under sodium amytal and 1 per cent novocain infiltration anæsthesia, the first-stage operation was done as previously described. The sac was dissected free to its neck and implanted high in the wound. Glucose solution and eggnogs were given through the catheter. Sodium amytal 3 grains was administered every 6 hours for the first 24 hours if necessary for sleeplessness and discomfort. The third day after operation the catheter was removed and the patient was permitted to swallow soft diet. He was up and about from then on until second operation.

Ten days after the first operation, on November 24, the second stage was done under novocain infiltration around the neck of the sac. The sac was removed and the wound was closed, following the technique already described. The catheter was inserted before the patient left the operating room. Sodium amytal was given the night before and the morning of the operation. The after treatment was the same as after the first stage, except that the catheter was kept in longer and was removed at night after the last feeding on the fourth day after operation.

On the fifth day, the dressings were changed and a spot of drainage about as big as a dime was observed. The patient was permitted to swallow milk; a small amount trickled out of the sinus. The catheter was reinserted by the patient himself every morning and left in place until his last feeding and withdrawn at night.

There was no drainage after 4 more days of this management, 8 days after the second-stage operation. The catheter and iodoform drain were left out and the patient was permitted to swallow a liquid diet. He was discharged from the hospital the following day, 23 days after his admission, with the wound healed. He was able to swallow without pain or discomfort and gained 6 pounds while in hospital.

SUMMARY AND CONCLUSIONS

1. The technique, as outlined in this article, has proved to be a satisfactory method of surgical management of Zenker's diverticulum.

2. The crux of the procedure centers around the complete and successful isolation of the sac to its beginning without opening the sac or the œsophagus.

3. The second stage is simple, the wound is reopened and the newly formed adhesions around the sac are separated down to its neck; the neck is ligated and sac is removed. The ligature should not be tied too tightly. If the neck of the sac is large this ligature may be applied with a needle picking up the mucosa in three or four places and tying as a pursestring suture, without invaginating the stump.

4. Many cases will have some drainage of swallowed fluids in from 3 to 6 days; however these fistulas usually will close if feedings are continued by catheter and swallowing is prohibited a few days more. Discomfort from the catheter will be minimized by removing it after the last feeding at night and reinserting it the next morning.

5. Three factors that aid in forming cicatricial tissue, which re-enforces the posterior pharyngeal wall, are as follows: (a) irritation following the first stage operation; (b) irritation produced by the iodoform wick; (c) irritation resulting from drainage following the second-stage operation.

6. Stricture rarely follows; postoperative dilatation of œsophagus is unnecessary in most cases.

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CANCER OF THE LIP

Report of Eighty-Eight Cases from the Steiner Clinic[1]

CALVIN B. STEWART, M.D., Atlanta, Georgia

CANCER of the lip may seem to be a rare disease but statistics have proved that the condition accounts for from 3 to 5 per cent of all deaths from cancer. In the Steiner clinic during the 5 years ending January, 1930, we have treated 88 cases in a total of 5,500 cases of cancer and allied conditions—an indication that cancer of the lip is a serious problem.

As to etiology, the same questions present themselves as in all cancer cases. Some believe that for every cancer there must be a separate cause, but if we are honest with ourselves we must confess profound ignorance as to etiology. The patient frequently gives a history of having a fever blister which has never healed. In a few instances, however, there is a definite history of irritation or trauma; for instance, the patient may have sharp teeth, he may have carried nails in his mouth, he may have smoked a short stem pipe, the protruding under lip may have been too much exposed to the sun, or the neoplasm may have arisen on a leucoplakia.

Statistics from this clinic agree with those in the literature that the lower lip is affected more often than the upper, the ratio being 20 to 1, but as to sex incidence, our figures show that the male leads with the ratio of 29 to 1 whereas the literature gives the ratio as 16 to 1. These figures may change in the future since women now use tobacco more commonly than formerly.

As to age incidence, our figures substantiate those in the literature. The ages range from 23 to 85 years, the decade most commonly affected being 50 to 60 years.

In cancer of the lip the pathological picture varies materially, ranging from sarcoma to adult cell carcinoma. So nearly all are of the squamous cell variety, that we can pretty well regard the others as rarities. Clinically we find the classification into the papillary and infiltrating types to be of great value. In the papillary type the growth spreads over considerable lip margin but metastasis occurs late. Although the infiltrating type may look very insignificant, it is very resistant, prone to recur, and metastasis occurs early and is extensive.

The diagnosis is usually made on the history of a persistent lesion which has grown progressively worse in spite of all efforts to relieve the condition. While the lesion usually ulcerates early, it does not necessarily do so. The cardinal diagnostic points as I see them are: first, a persistent sore on the lip, usually the lower lip; second, a lesion that when gently palpated with one finger in the mouth discloses a definitely indurated base unless it be of the papillary variety; and third, a lesion in which when the crust is removed the granules are found to be bristly and the exposed surface usually bleeds easily on sponging. The growth must be differentiated from (1) simple ulceration, (2) leucoplakia, (3) tuberculosis, and (4) syphilis.

Usually the simple ulcerations are of short duration and the patient gives a history of trauma, as operation, injury, medications, etc. In these lesions the bristly granulations and induration are lacking.

Leucoplakia with ulceration offers great difficulty in diagnosis. Leucoplakia is a precancerous lesion and there must necessarily be a time when only one cell is cancerous; if in 1 month after local destruction by means of fulguration, there is no induration and no recurrence, then the growth probably is not malignant. The patient must be carefully watched, however, for any evidence of recurrence.

The tuberculous ulcer is usually a manifestation of generalized disease. In this type the surface of the growth resembles the consistency of apple butter and the base of the growth is not so firm.

Syphilis can be recognized by the rapid progress of the disease, and the early, diffuse, relatively soft lymphadenopathy. In addition usually spirochætæ can be demonstrated or a positive serum reaction can be obtained. The admission of the patient to exposure to syphilis also helps.

Our study of lip carcinoma covers the period from October, 1924, when the Steiner clinic was opened, to January, 1930. We are making no claims for cures but merely wish to report our observations for what they are worth. The institution has gone through many trials in organization during the period of this study, but fortunately the care of the lip cases has not changed materially. Our follow-up system has not been all we would have liked, due to the financial depression. It is a fact, too, that in many

[1] Read before the Atlanta Clinical Society, June 3, 1930.

Fig. 1, left. Case 1. Papillary carcinoma of lip without nodes. (Group 1.)

Fig. 2. Case 1. Three months after radium treatment. Is now free of disease 4 years and 9 months after treatment.

Fig. 3, left. Case 2. Insignificant looking infiltrating lesion of lip with nodes in neck. (Group 2.)

Fig. 4. Case 2. Lip treated with radium and right neck dissected 3½ years ago. Two and one-half years ago left neck was dissected. Nodes from both sides of the neck showed carcinoma on miscroscopic study. Now free of disease.

instances the patient considers lip cancer as only of minor importance and once he is free of local disease he considers further trips to the hospital superfluous. Other factors affecting our follow-up were the fact that the street names and numbers in Atlanta have recently been changed and finally that when we first opened the clinic we had no social service department.

Our policy has been not to make biopsies in early lip lesions. We believe that this procedure stimulates metastasis and necessitates the loss of some of the lip. We prefer to have combined opinions of two or more trained in this work. Of course, after deep ulceration has taken place, the removal of a small specimen at the edge of the growth can do no harm.

The treatment consists in eliminating the irritating factor if any and then making a mold of the lesion of warm dental modeling compound. A special effort should be made to get the material well down into the buccogingival groove and beyond the lesion in all directions. Each side of the neck is exposed to an erythema dose of filtered X-rays. The primary lesions are treated by means of radium which is placed in the skin side of the mold described, and the mold is held in position by the teeth. A satisfactory reaction will temporarily remove the epidermis from the area exposed. The raw surface thus produced is rather uncomfortable to the patient for about 2 weeks, beginning 7 days after treatment. Healing takes place after about 30 days. The patient has only a blanched out area but there is no deformity.

Metastases fortunately seldom go beyond the glands of the neck and for this reason we prefer to leave the glands to act as sieves in case of cell emboli. We feel that if the patient is periodically examined, the nodes can be detected in time to remove before the capsule is broken. When nodes are found they are removed by unilateral block neck dissection and at this time gold filtered radium emanation tubes are buried in questionable areas. These radium tubes probably do more than the thorough dissection to prevent recurrences. If the nodes cannot be removed surgically, gold tubes sufficient to sterilize them are left in the mass, the sterilizing dose being about the equivalent of 10 skin erythema doses.

For clarity of description, we are using the following classification: Group 1 includes cases in which only the lip is affected. In Group 2 in addition to the lip lesion there are definite but movable nodes in the neck. Group 3 includes the far advanced cases in which the lesion involves the jaw or there are inoperable glands of the neck. In the first group we had 64 cases, in the second group 18 cases, and in the third group 6 cases.

Of the total of 88 cases, we have failed to trace 31 to date. Of the 31 only 7 never returned for observation. These we are willing to count as dead from their disease. The 24 remaining were followed from a few months to 4 years and were free of disease on the last visit. We do

Fig. 5, left. Case 3. Lip replaced by Type 1 epidermoid carcinoma, periosteum seemed invaded, nodes were enlarged. (Group 3, due to periosteal invasion.)

Fig. 6. Case 3. Three months after removal of the lip and periosteum with a thermal cautery. Nodes seemed smaller after X-ray exposure. Case lost.

not feel that these should be classed as dying from cancer, especially as all but 6 were Group 1 cases. Of the 88 cases only 3 were females, and in only 4 in the 88 was the upper lip affected.

The primary lesions were treated with radium. There were 74 such cases. Occasionally when an area was obstinate, gold filtered tubes of radium emanation were buried in it. Surgical measures were used in 17 cases, and in 2 cases electrocoagulation alone was used.

In Group 1, in which there were 64 cases, 24 have been lost track of. This leaves 40 traced cases. Of these 2 died of the disease. One died of heart disease 3 years after treatment. This patient had been free of signs of malignant disease during this period.

In Group 2 we have failed to trace 3 of the 18 cases. Five patients died, 1 of pneumonia 18 months after treatment but he was free of any evidence of malignant disease at death. Another patient died with nephritis 3 years after treatment, but he had remained free of malignant disease after radium treatment and two neck dissections. This leaves 3 who died of their disease and 2 who are now under treatment for recurrent nodes. Of this group, only 8 are now free from recurrence from 1 to 5 years after treatment.

In Group 3 all 6 patients are dead or lost. Four are known to be dead. Some of these advanced cases, however, were markedly relieved by means of irradiation.

SUMMARY AND CONCLUSIONS

1. It is too early for us to report end-results.
2. Epithelioma of the lip can be destroyed by radium without causing deformity.
3. In the treatment of cancer, one should not be limited to any one agent—metastatic nodes should be removed surgically when possible and radium emanation should be left in questionable areas.
4. Inoperable nodes can be sterilized by radium implants.
5. Advanced cases can be relieved by means of small doses of X-ray or radium.

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ROENTGENOLOGICAL PELVIMETRY AND INTRA-UTERINE CEPHALOMETRY

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ONE of the earliest investigations undertaken with the roentgen-rays was a systematic study of the various stages of development of the osseous system. It was found that the first radiable center of ossification occurs in the clavicle about the seventh week of embryonic life and that there follows a regular and systematic development of the bones to birth, and through infancy, childhood, puberty, adolescence, and old age. This makes it possible by a study of the roentgenograms alone to tell the approximate age of the fetus or individual examined.

Muellerheim, in 1898, was the first to mention the use of the X-rays in pregnancy. As technical difficulties were overcome and better roentgenograms were obtained, there naturally followed a study of the fetus *in utero*. Little was known of the biological effect of the roentgen-rays at this time, and no one dreamed of the deadly possibilities lurking in them. Their fascinating properties lured on the unsuspecting enthusiasts, who at first regarded them as being as harmless as they were interesting. Then, slowly but surely, the eyes of the medical profession were opened to the serious and even fatal results that followed the indiscriminate and careless use of the rays; persistent cutaneous ulcerations or burns developed in those who were long exposed to their action.

About the same time it was observed that pregnant women who had undergone extensive roentgen-ray treatment, or who had been exposed to the rays for long periods of time, frequently aborted or gave birth to defective or malformed offspring. Naturally, there arose in the minds of many members of the medical profession considerable fear as to the use of the roentgen-ray, and this was especially true as regards its obstetric indications.

Investigators have demonstrated that the roentgen-ray has a selective action on embryonic tissue, and that the sensitiveness of the embryonic cell is greatest when its productive activity is most intense. Reports have been published which conclusively demonstrate that it is possible to produce changes in the ovum or fetus by prolonged exposure to the roentgen-ray, altering its development and resulting in the birth of a mentally or physically defective child. While many normal and healthy infants have been born following long exposures to the roentgen-rays, opinion is almost unanimous that women of the child-bearing period should not receive therapeutic doses until the possibility of pregnancy is absolutely eliminated.

What has just been said regarding the therapeutic application of the roentgen-ray has no bearing on its diagnostic use, in which only short and infrequent exposures are given. Reports are now available of many thousands of pregnancies in which the roentgen-ray has been used for diagnostic purposes, in both the early and late stages, without any injurious effect whatever either to mother or child. Since the fear of the roentgen-ray for diagnostic purposes in pregnant women has largely disappeared, and as technical and mechanical improvements in apparatus have taken place, the roentgen examination has been able to furnish more and more information valuable to the obstetrician.

It would be difficult to conceive of a more positive sign of pregnancy than the visualization of the fetal skeleton, and Williams, in his latest textbook, refers to the roentgen method as the fourth positive sign. The fetal skeleton should always be seen on the X-ray film during the latter months of pregnancy, irrespective of the size of the patient; and should be seen, in most instances, as early as the fourth or fifth month. Under favorable conditions a positive diagnosis of pregnancy can now be made as early as the third month. A little over 2 years ago, I made serial roentgenograms of 10 patients who were supposed to be less than 2 months pregnant, X-raying them regularly every 2 or 4 weeks until a fetus was visualized. Two showed the fetal skeleton about the twelfth week, 2 about the fourteenth, and 3 about the sixteenth week. Three proved not to be pregnant. All 7 of the pregnant women gave birth to normal babies; there were no ill effects shown, although some received as many as ten exposures during the early weeks of pregnancy.

Among the factors which complicate early visualization are the thickness of the abdominal walls and soft parts surrounding the fetus; the presence of amniotic fluid and the distance of the fetus from the film, whereby the slightest movements are exaggerated, thus blurring or obliter-

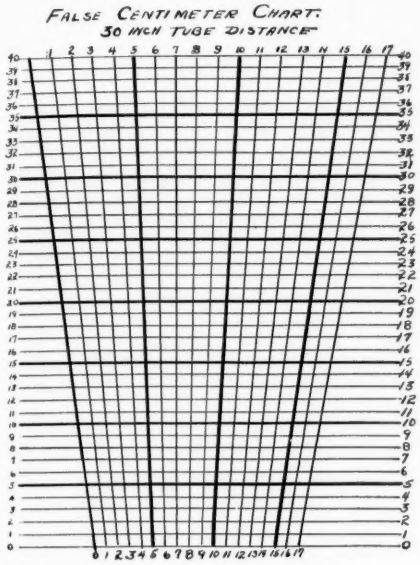

Fig. 1. False centimeter chart, 30 inch tube distance.

ing the delicate outlines of the bony skeleton. However, some of these difficulties may be overcome by pneumoperitoneum, or by inflating the bladder or rectum with air. Multiple pregnancies can very readily be made out and in several instances triplets have been diagnosed before birth by means of the roentgen-ray.

A roentgen examination should always be made whenever a differential diagnosis is to be established between pregnancy and uterine tumor. Serious and mortifying mistakes may be prevented if the abdominal surgeon insists upon a roentgen examination before attempting a hysterectomy for supposed fibroma or myoma, especially when such a growth is accompanied by menstrual suppression. Abnormalities of the fetus can be determined with greater certainty and at an earlier date with the roentgen-ray, than by any other means, and a number of fetal monsters have been discovered before birth. Case, in 1922, was the first to diagnose an anencephalic monster with the roentgen-ray, prior to its birth. Campbell and Webster reported the second in 1924. Several have been reported since, and to these I can add 2 more cases. The number will undoubtedly increase as the use of the roentgen-ray becomes more general in obstetrical practice. The importance of making a positive antepartum diagnosis of a monstrosity or grossly defective child cannot be overestimated. Death of the fetus

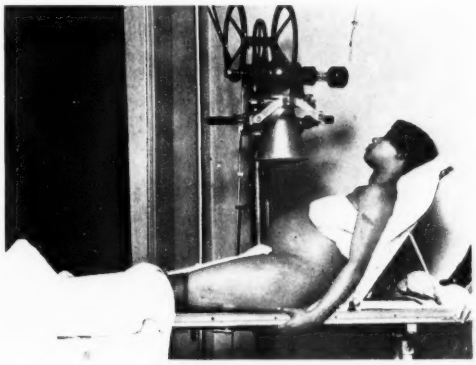

Fig. 2. Patient in semi-reclining position ready for first exposure.

(if not recent) can usually be diagnosed before delivery by the roentgen-ray, through the demonstration of an overriding of the cranial bones and shrinkage of the skull contents.

Much has been written about roentgen pelvimetry and a large number of methods have been described, most of them too complicated to be practical. Aside from Thoms excellent work on fetal cephalometry described in the *Journal of the American Medical Association*, July 6, 1930, very little has been done to measure accurately the head of the child before birth. It may be just as difficult, or even impossible, to deliver a hydrocephalic child through a normal pelvic canal, as it would be to deliver a normal child through a contracted pelvis, and unless the roentgen examination can determine the size of the fetus, the pelvic measurements must necessarily be of limited value. The following method of measuring both the maternal pelvis and fetal skull has been used in the Roentgenological and Obstetrical Departments of the Maryland University Hospital for over 2 years, and its simplicity and practicability recommend its more general adoption.

A chart (Fig. 1) is used, showing the degree of distortion at centimeter heights above the film, at a fixed tube-film distance. This chart can easily be made for any technique by making exposures of a perforated centimeter rule suspended at various heights between the film and tube.

The first film is made with the patient on the Bucky diaphragm in a semi-reclining position, as described by Thoms. The back is supported at a proper angle to bring the plane of the pelvic inlet parallel with the X-ray film (Fig. 2). The distance between the film and top of the symphysis pubes is then measured. The target of the tube is then

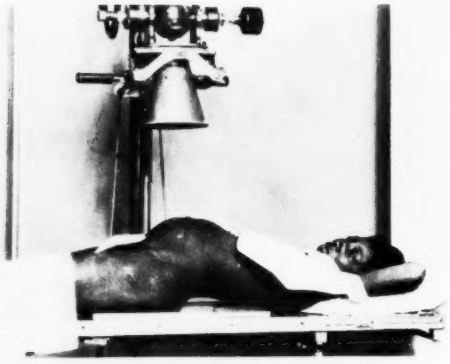

Fig. 3. Position of patient to make cranial measurements.

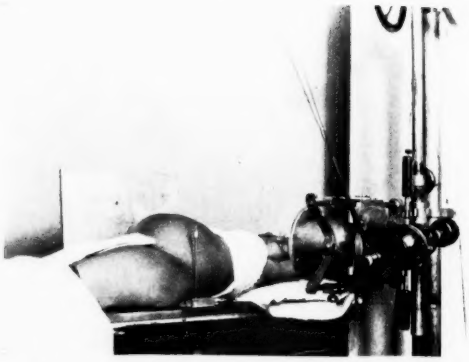

Fig. 4. Film now at side of patient who remains on back.

placed 30 inches above the film, the central ray being directed vertically through the center of the pelvis. The exposure made in this position shows the outline of the pelvic brim enlarged in proportion to its height above the film. By measuring with calipers the diameters of the pelvic brim on the film and checking these against the centimeter scale on the chart at the height of the symphysis above the film, the corrected or true measurements of the pelvis are obtained.

The same procedure is used in making the cranial measurements. The position of the head of the child is located as accurately as possible, either by manual or roentgen examination. An exposure is made with the patient lying flat on her back, the tube 30 inches from the film and centered over the head of the child (Fig. 3). The distance from the center of the child's head to the film is measured. A second exposure is made with the patient lying on her back, the film this time is placed against her side nearest the baby's head, and the tube centered opposite, on a plane with the skull at a distance of 30 inches (Fig. 4). The distance between the center of the skull and the film is again measured.

When the films are ready for examination, the diameters of the fetal skull, as shown on the films, are measured with calipers and checked against the false centimeter scale at heights corresponding to the distance of the head from the films in the different exposures, and the corrected or actual size of the fetal skull is obtained. The fronto-occipital and biparietal measurements are given because they are usually the easiest to obtain.

The advantages of this method are:

1. Its accuracy in determining the size of the maternal pelvic inlet and the fetal head before delivery.

2. Its simplicity, in that no special or complicated apparatus is required.

3. All the preliminary work can be carried out by trained technicians.

4. It takes but very little time to compute the measurements after the films are ready to examine.

I would like to acknowledge the co-operation of the Obstetrical Department of the University of Maryland, especially the help given to me by Dr. L. H. Douglass, Dr. J. M. Reese, and Dr. M. A. Novey, whose kind assistance in furnishing material has made it possible to carry out the work described in this paper.

SUPERFICIAL AND DEEP CONTINUOUS SUTURE

Supplementary Report

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In the *American Journal of Surgery* of July, 1929, I described in detail a combined superficial and deep continuous suture—a new hemostatic, approximation, and tension suture. In this article I stated that I had personally used this suture on my surgical service both at the United Israel-Zion Hospital and the Brownsville and East New York Hospital in about 300 cases during the previous 3 months, with most gratifying results.

It is now about 2 years since this article was published and I would like to present a supplementary report giving both my personal experience with it and the reaction and experience of many other surgeons throughout the country who have adopted the method. I will not present at this time a detailed description of the suture as it was fully described in the article mentioned. Figure 1, however, shows the essential principles of the simple technique.

It is natural for the originator of a new procedure at times to be overenthusiastic about it. In this respect the writer proves to be no exception. However, I believe my enthusiasm is justified for the results have been so satisfactory that in the past year the suture has been used in over a thousand cases to the exclusion of any other continuous suture.

Whenever a continuous suture is indicated especially in the skin, it has been my practice to use the combined superficial and deep suture which has fulfilled all the requirements and in addition has the following advantages:

1. The suture is simple and speedy of execution. It is foolproof; the edges cannot invert nor evert. The novice becomes master of the suture at the first attempt (Fig. 1).

2. The suture evenly approximates the deep parts of the skin as well as its finest cut edges. It thus provides two wide opposing raw surfaces for healing with a resulting firm subcutaneous as well as cutaneous union of the cut edges. The deep part of the suture takes away any tension on the skin edges and the scar, therefore, does not stretch and widen out as happens with the average suture (compare Figs. 1 and 2).

3. The suture prevents puckering between the stitches, which is unavoidable with interrupted sutures and it maintains an even and constant

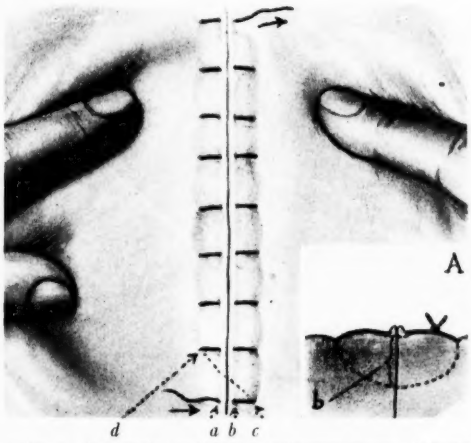

Fig. 1. Superficial and deep continuous suture. Needle enters at *a*, passes through skin edges and comes out at *b*, passes through skin and subcutaneous tissue at *c*, then goes to *d*, and the same process is repeated. Note firm and even approximation at line of incision with no tendency toward separation even when tension is applied to it. Insert, A, shows the wide and close approximation of raw surfaces of skin and subcutaneous tissues *b* brought about by use of this suture. Compare with Figure 2.

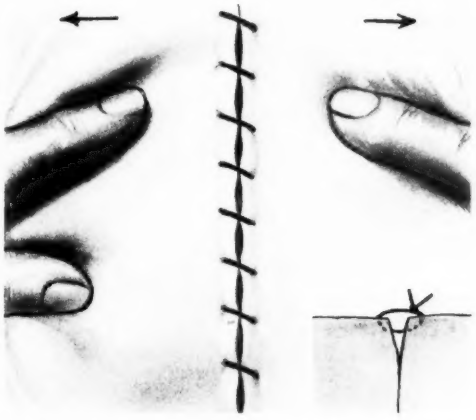

Fig. 2. Ordinary continuous suture. Note gaping and separation of skin edges between sutures that may take place if tension is applied to them.

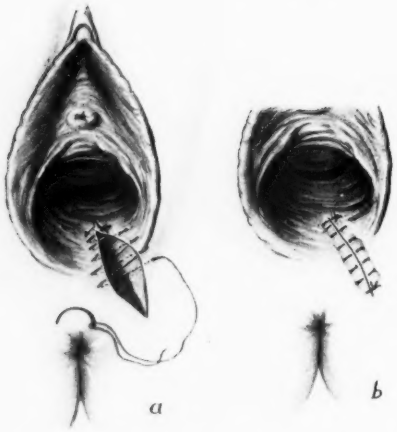

Fig. 3. Method of suturing episiotomy wound. *a*, Upper half of wound sutured, showing knot and suture passed through the superficial as well as the deep structure of perineum. *b*, Suture completed. Note even and firm approximation of cut surfaces effecting perfect hæmostasis and avoiding dead space.

tension on all the tissues at the line of suture. One may compare it to a "zipper" with its many advantages over buttons.

4. The suture effects complete hæmostasis at the suture line and obliterates dead space—factors conducive to primary union in its fullest sense in all clean cases.

5. The suture is removed with great ease, and the scar left after healing is almost invisible.

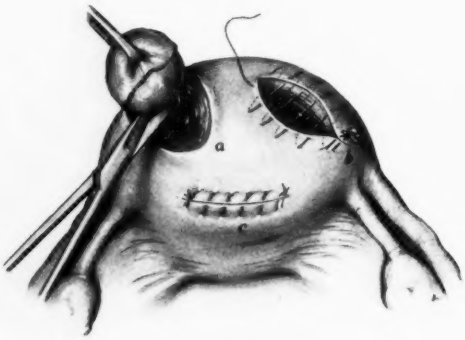

Fig. 5. Suture of uterus in myomectomy. *a*, Fibroid enucleated. *b*, Suture tied at one end and passed through deep and superficial portions of uterine wall. *c*, Suture completed.

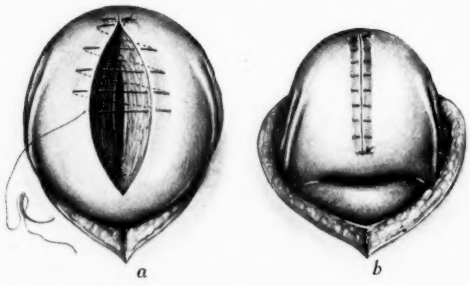

Fig. 4. Suture of uterus in cæsarean section. *a*, Uterine incision partly sutured. The superficial bite of the suture includes peritoneum and edge of muscle wall. The deep bite of suture includes almost the whole thickness of uterine wall except its mucous membrane. *b*, Suture completed.

It is my purpose in this supplementary comment to point out in more detail the cases in which this suture can be used to great advantage and why. Originally it seemed to me to be adaptable mainly in closing the skin edges following laparotomy, but later I, as well as many others who have used it, found it advantageous in a great many other ways.

To illustrate: An obstetrician of a recognized hospital told me one day that he had been using this combined superficial and deep suture to great advantage in closing episiotomy wounds and perineal lacerations following labor. As I had not

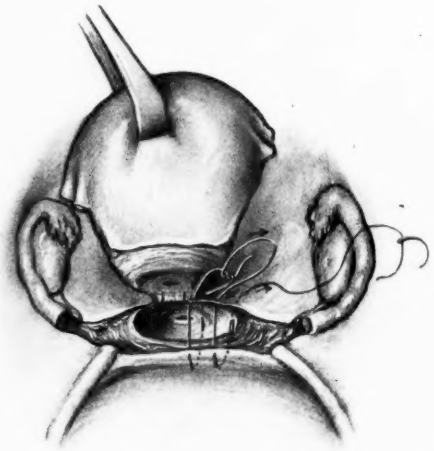

Fig. 6. Suture of cervical stump and broad ligaments in hysterectomy. Cervix cored out. Left half of cervical stump sutured. The knot is left untied and suture not tightened for purposes of illustration.

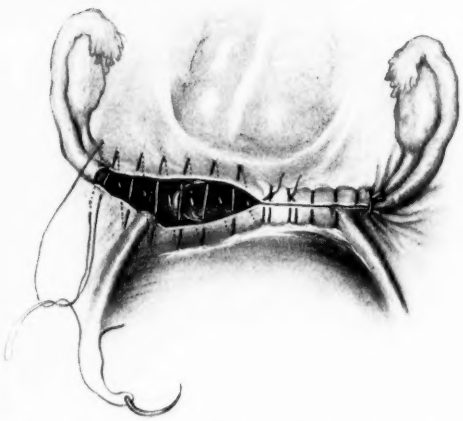

Fig. 7. Suture continued. Left half completed. Right half shows suture passed through cervix and broad ligament but not tightened.

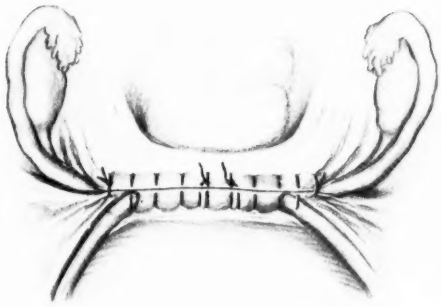

Fig. 8. The two sutures completed. Showing peritonealization of cervical stump and broad ligaments.

practiced obstetrics for over a decade, his statement took me by surprise but on further discussion, he fully convinced me of its great advantages, which are as follows:

In doing an episiotomy, one naturally cuts through a good portion of the vaginal mucous membrane, some of the perineal muscles, the fascia and skin, and this leaves a wide gaping wound. Following the delivery of the child, the

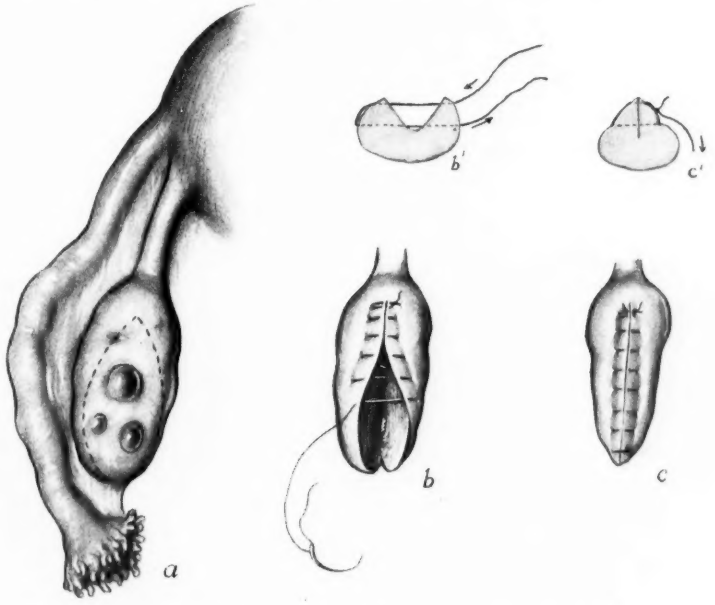

Fig. 9. Suture for partial oophorectomy. *a*, Cystic ovary with outline of portion to be excised. *b*, Part of ovary excised and suture partly completed. *b'*, Cross section of same. Note how suture approximates the deep as well as superficial cut surfaces. *c*, Suture completed. *c'*, Cross section of same showing the beginning of suture tied.

Fig. 10. Peritonealization of liver bed following cholecystectomy. Note passage of suture through free edges of peritoneum and liver bed which obliterates dead space.

combined superficial and deep continuous suture (Fig. 3a), makes possible with very little difficulty and in a very short time the approximation of all these layers with one suture. First we take a superficial bite of either edge of the cut mucous membrane at the extreme upper end, then a deeper bite to include also the cut muscles and fascia, then a superficial bite, and so on until the mucous membrane, muscles, fascia, and skin are evenly approximated in a few minutes. In this way dead space is obliterated, even approximation of the cut structures is obtained, and perfect hæmostasis is secured (Fig. 3b).

Likewise in closing the uterus following cæsarean section (Fig. 4a), one can save a great deal of time and obtain all the desired results with this suture. Here the superficial bite includes mainly the peritoneal edges while the deep bite includes the entire thickness of the muscle wall of the uterus except the mucous membrane, so that even approximation of the uterine incision, perfect hæmostasis and peritonealization are obtained in a very short time (Fig. 4b). The entire procedure should not take over a minute.

The suture is especially suitable in closing the uterine incision following a myomectomy (Fig. 5). In the past 5 years I have made it an almost universal practice to do a myomectomy instead of a hysterectomy in removing uterine fibroids in young women, especially in those desirous of bearing children. In a number of such cases it seemed hardly believable that a myomectomy would be practical, nevertheless many fibroids—subperitoneal intramural, and intraligamentous—were successfully removed. The fibroids ranged in size from that of a walnut to that of a grapefruit and as many as twenty have been found in one patient. Following the myomectomy the uterus is left in fairly good condition for future pregnancies. In two instances I have removed two large degenerating fibroids of the uterus which were causing acute symptoms in primiparæ in the sixth and seventh months of pregnancy, and in both instances the patients went on to full term and were delivered of healthy offspring. In these cases as well as in others, the combined superficial and deep suture is most advantageous. By means of it the cavity produced by the enucleation of the fibroid is obliterated and the deep raw surfaces of

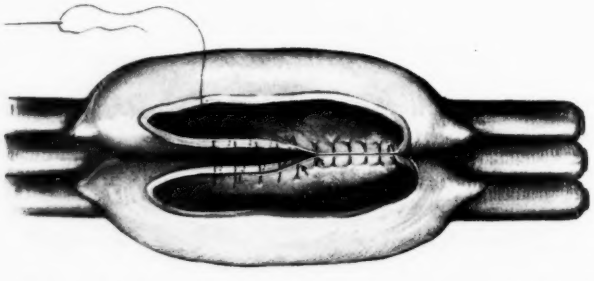

Fig. 11. Suture for posterior wall of gastro-enterostomy. Note how the deep bite includes the entire thickness of walls of stomach and intestine, while the superficial bite includes and evenly approximates the cut edges of the mucous membrane as indicated by arrows.

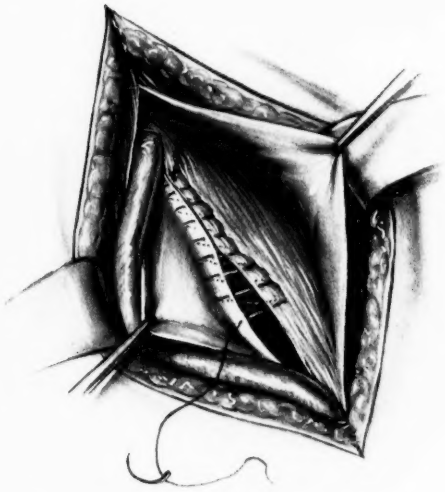

Fig. 12. Bassini hernioplasty with author's suture. It approximates a double fold of Poupart's shelf to a wider and thicker portion of conjoined tendon and thus avoids tearing through some of the fascial strands when suture is tied.

the uterine wall are approximated so that the uterus is peritonealized, the cut muscles are approximated, and perfect hæmostasis is secured.

The chief difficulty after a supravaginal hysterectomy is to obtain perfect approximation, hæmostasis, and peritonealization at the site of the cervical stump and broad ligaments. Proper technique demands a coring out of a cone-shaped portion of the cervix to facilitate such approximation (Fig. 6). In these cases, the superficial deep continuous suture is most ideal, for the superficial bite approximates the peritoneum and free edges of cut cervix while the deeper bite includes a good thickness of what is left of the cervical stump (Figs. 7 and 8).

Very few structures require more careful and delicate handling than do the ovaries. Following partial resection of cystic ovaries, the cut surface may resemble an olive from which a segment has been removed (Fig. 9). It is best to approximate the entire depth of these cut surfaces and this can be best accomplished with this suture.

In suturing the raw surface of the liver, following cholecystectomy, the cut peritoneal edges are generally brought together thus leaving a hollow tunnel between the liver bed and the sutured peritoneum. In this suture by getting a bite of the liver bed at the same time, the dead space can be obliterated with little effort (Fig. 10).

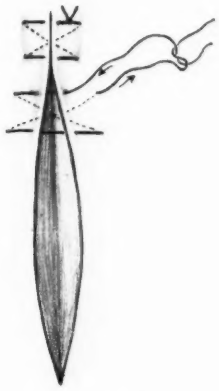

Fig. 13. The author's figure of eight superficial and deep suture.

The average continuous through-and-through suture used for closing the posterior wall in a gastro-enterostomy does not effect an even approximation of the cut edges of the mucous membrane, muscle, and peritoneum of the stomach and intestines. However, if this suture is used as illustrated, the approximation can be made more perfect (Fig. 11).

Likewise in a Bassini hernioplasty, the approximation of the conjoined tendon to Poupart's ligament can be made more effective with this suture, and a wider and firmer approximation and union obtained between these structures (Fig. 12).

This suture does not preclude the use, if the surgeon so desires, of an additional interrupted stitch to reinforce the line of approximation in operations such as the Bassini hernioplasty, perineorrhaphy, or cæsarean section. (To avoid confusion, such sutures have been omitted from the illustrations.)

In the presence of suppuration, if a continuous suture is deemed inadvisable, or in approximating muscles and fascia as in a Bassini hernioplasty if the surgeon prefers an interrupted to a continuous suture, the writer would suggest his superficial and deep interrupted suture in the form of a figure of eight as illustrated (Fig. 13). In reality this suture is two interrupted superficial and deep sutures, combined in one. An appropriate name for this suture would be a figure of eight superficial and deep suture.

In thyroidectomy, the surgeon and especially the patient are very much concerned about getting an almost invisible scar, and here again our suture is ideal for the purpose (Fig. 14), for it

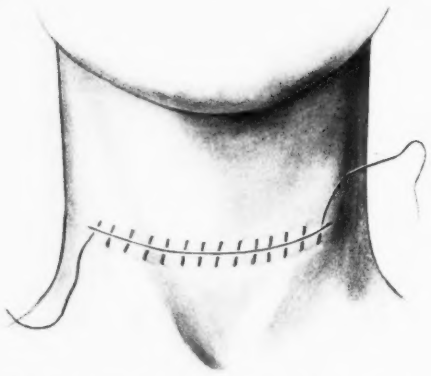

Fig. 14. An ideal skin suture following thyroidectomy.

brings together in perfect approximation the subcutaneous tissues and the edges of the skin. Indeed, in a good many cases, the writer was unable to locate the site of the incision after the wound healed. Even the stitch holes become invisible in a very short time when the suture material is removed at an early date, that is within 3 or 4 days following the operation. Having approximated the platysma separately with a catgut suture, there is no fear of the separation of the skin even if the suture is removed at an early date.

The suture is indeed most desirable in plastic surgery of the face, following automobile accidents, etc., when the greatest concern of the patient is to get as little disfigurement as possible. For the ambulance surgeon or general practitioner who is called upon in an emergency to sew up lacerations so frequently met with these days, this suture has many advantages. The facilities under these circumstances are, as a rule, not of the best and to get proper approximation with interrupted sutures consumes a great deal of time, requires more preparation, suture material, and needles. With our method, however, one suture will accomplish the same result with a saving of time and with less chance of the wound becoming infected.

The incidence of wound infection not only in the writer's experience but also in that of a great many other surgeons has been greatly lessened since the adoption of this suture as a routine in clean cases. It has been found especially useful in securing perfect cosmetic results in plastic surgery. Here the wounds are usually clean.

In brief, the suture is of practical value in the following instances:

1. Closure of skin wounds of any kind.
2. Repair of perineum following episiotomy or lacerations.
3. Closure of uterus following cæsarean section.
4. Suturing of cervical stump following hysterectomy.
5. Suturing of uterine wall following myomectomy.
6. Suturing of the cut ovarian surfaces following partial resection of ovary.
7. Peritonealization of liver bed following cholecystectomy.
8. Suturing of conjoined tendon to Poupart's ligament in Bassini hernioplasty.
9. Approximation of the posterior wall in gastro-enterostomy.
10. Approximation of the bisected kidney cortex following nephrotomy.

There are many other instances in which this suture can be used to great advantage but space will not permit their mention. The suture will be found more and more useful as the surgeon becomes accustomed to its use. It is time saving and technically perfect; it is conducive to perfect hæmostasis, primary union, firm healing, and an almost invisible scar.

It is gratifying to learn that the suture has been received with enthusiasm by many general surgeons, gynecologists, orthopedists, and others in the profession, as is evidenced by communications from these men, all of whom state that they have found the suture of great value in their respective fields of surgery. The writer is grateful to them for their fair expressions of opinion as to the merits of the suture and for their helpful suggestions as to its adaptability, even in fields somewhat foreign to the writer.

SUSPENSION OF THE UTERUS

Modification of Technique

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WHENEVER numerous methods are advocated and in use for the treatment of a surgical condition, one is instantly struck by the philosophy that any or all of these procedures leave something to be desired. Obviously, if any one method was wholly satisfactory, it would be used to the exclusion of all others.

Most discussion of uterine suspension is concerned with the shortening of the round ligament at or near its juncture with the uterus, or at its point of passage through the abdominal wall; the choice of location of shortening lying with the individual operator, and with the pathological condition which may or may not be present in the tubæ uterinæ.

Of the operations which have been devised to shorten the round ligament at its uterine end, the one most in vogue is the Baldy-Webster. It is not wholly satisfactory for several reasons, the first of which, in these days of considerations of peritonealization, is the possibility of raw areas at points of suture, with subsequent adhesions in these locations.

A second is the possibility of sutures being burned out rapidly with breakdown of the suspension before agglutination has taken place between the serosa of the round ligament and the serosa of the uterus.

A third reason is that but one-sixth to one-third of the circumference of the ligament is brought into contact with the serosa of the uterus and hence adhesion and firm suspension occurs only to that extent.

A fourth disadvantage is that the sutures may hold and agglutination occur at the midline of the uterus, and not from the midline laterally, thus forming a loop of the round ligament through which bowel may herniate, or into and through which omentum may herniate and become fixed. And this matter of herniation is also true of the point in the broad ligament through which the round ligament is drawn in bringing it posterior to the uterus.

The modification here described and illustrated obviates these disadvantages. The uterus is grasped by a uterus holding forceps and drawn upward and forward, and an incision an inch in length is made in the midline on the posterior aspect of the uterus, and with two-thirds of the incision below the level of the round ligaments (Fig. 1). A subserosal dissection is then made bilaterally and to a point on the round ligament depending upon the amount of shortening required. The round ligament is then grasped—bilaterally—and drawn medially (see Fig. 2). The two ligaments are then apposed and adjusted for tension and obviation of anteflexion, and further, that the uterus be not retroflexed, as though it were thrown over a clothes line. (It is for this reason—that of adjustment—that two-thirds of the incision in the serosa shall lie below the level of the round ligaments.) The suspensive mechanism having been thus checked for fault, apposition is secured by suture of the ligaments to each other and to the uterus (Fig. 3). The serosal incision is then closed by a subserosal continuous suture.

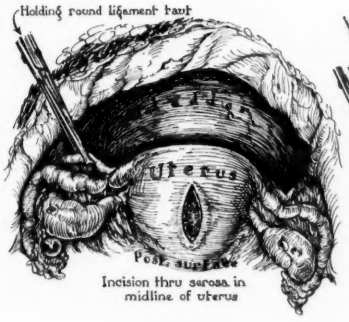

Fig. 1.

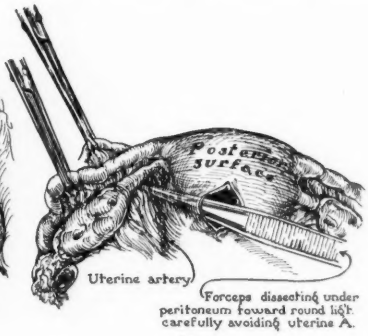
Posterior surface
Uterine artery
Forceps dissecting under peritoneum toward round lig't. carefully avoiding uterine A.

Fig. 2.

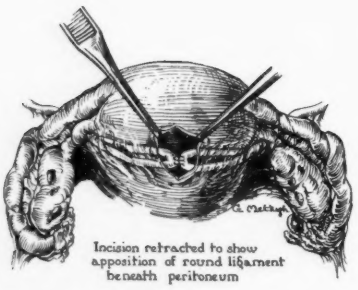

Fig. 3.

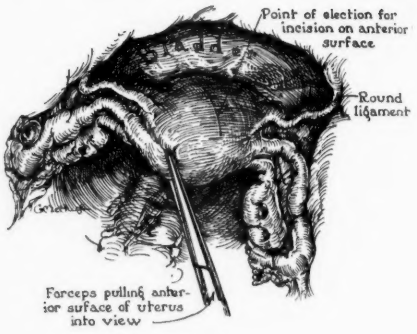
Point of election for incision on anterior surface
Round ligament
Forceps pulling anterior suface of uterus into view

Fig. 4.

As illustrated (Fig. 4), the procedure may be applied on either anterior or posterior aspects of the uterus, the choice depending upon uterine and extra-uterine conditions obtaining in the pelvis.

It is evident that with this modified technique, there is no break in the continuity of the peritoneum except at the line of serosal incision, and hence an opportunity for the formation of adhesions to the uterus only at that point; that there is less danger of the suspension breaking down, since agglutination and subsequent fibrous union occurs over the entire circumference of the round ligament, and not only over but from one-sixth to one-third of available area; that even though the individual oxidizes catgut very rapidly the suspension is likely to maintain its integrity; and last, that there is no opportunity for herniation either through a loop of the round ligament or a rent in the broad.

Note: Since the serosa is sometimes difficult of separation, the writer frequently, before incision, injects a solution of normal saline subserosally in the midline and laterally, thus separating the serosa in the midline and along the course of the lateral dissection. The lateral dissection is then simplified and not at all difficult of accomplishment. (This method of separating the serosa from serosa invested organs is to be more fully described in a subsequent article with respect to the gall bladder.)

ONE HUNDRED AND SEVENTEEN CONSECUTIVE CERVICAL CÆSAREAN SECTIONS WITHOUT MATERNAL MORTALITY[1]

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RECENTLY I[1] reviewed the histories of all the cervical cæsarean sections which had been performed at the Chicago Lying-in Hospital up to July 1, 1929. There were 874 conservative cervical cæsarean sections and 21 additional laparotrachelotomies which were followed by amputation of the uterus. The total maternal mortality for the 895 operations was 1.23 per cent and the total fetal mortality was 4.6 per cent. The study proved interesting to me and I decided to learn still more by analyzing my own cases. I found that up to July 1, 1930, I had performed 108 conservative and 9 radical cervical cæsarean sections. These operations were performed upon patients encountered in private practice, women seen in consultation with other physicians, and ward patients cared for at the Chicago Lying-in Hospital. In this series there were no maternal deaths but there were 5 fetal deaths (4.3 per cent).

Only the salient features of the 117 operations are given in the present analysis.

PARITY

The parity of the patients is shown in Table I.

INDICATIONS FOR OPERATION

The indications for the abdominal deliveries are shown in Table II.

In many instances there were 2 or more reasons for performing the cæsarean section but in Table II only the most important indication is listed. The incidence of cephalopelvic disproportion, namely 47 per cent for this series of cæsarean sections, is very low. However, since 22 of the 23 patients listed above as having had previous cæsarean sections had contracted pelves, the real incidence for cephalopelvic disproportion in this series is at least 65.8 per cent. Among the 23 patients who had previously had abdominal deliveries, 11 had had laparotrachelotomies, 10 had had classic operations, and 2 had had both types. Of the 11 patients in the first group 5 were given a test of labor, and of the 10 in the second group 3 were permitted to go into labor. Elective operations were performed on the two in the last group.

Cæsarean sections were performed on 11 patients (9.4 per cent) who had toxæmia of pregnancy. This is a relatively large frequency but it is due to the fact that in severe cases of toxæmia without convulsions we believe in emptying the uterus if medical treatment does not produce improvement. In eclampsia, the pregnancy is terminated as soon after the first convulsion as possible. The method selected for all patients with toxæmia is the one which is safest for the mother. Cæsarean section is performed for only a small percentage of the cases. We resort to cæsarean section if the patient is a primipara at or near term, with an undilated cervix and a floating fetal head. We attempt to use local anæsthesia for all patients with toxæmia regardless of whether delivery is accomplished vaginally or abdominally.

TABLE I.—PARITY

Parity	Cases	Per cent
Primipara	58	50.0
Secundipara	38	32.5
Tertipara	9	7.7
Quadripara	4	3.4
Quintipara	4	3.4
Septipara	2	1.7
Nonipara	1	0.85
Undecipara	1	0.85
	117	100.4

TABLE II.—INDICATIONS

	Cases	Per cent
Cephalopelvic disproportion	55	47.0
Previous cæsarean sections—test of labor	8	6.8
Previous cæsarean sections—no test of labor	15	12.8
Toxæmia without convulsions	9	7.7
Eclampsia	2	1.7
Placenta prævia	7	6.0
Abruptio placentæ	5	4.3
Cardiac disease	5	4.3
Dystocia dystrophia syndrome	4	3.4
Tumor blocking pelvis	2	1.7
Repeated stillbirths	2	1.7
Goiter, toxæmia, wearing tracheotomy tube	1	0.85
Previous rupture of uterus	1	0.85
Three almost fatal postpartum hæmorrhages	1	0.85
	117	99.95

[1]Thesis presented at the Forty-third annual meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Niagara Falls, Ontario, September 25, 1930.

Hæmorrhage was an indication for operation in 12 cases (10.3 per cent). Seven cæsarean sections (6 per cent) were done for placenta prævia and 5 (4.3 per cent) for abruptio placentæ. We prefer the abdominal route for most cases of central or partial placenta prævia if there has been much loss of blood, regardless of the condition of the child, because the operation is performed in the interests of the mother. When necessary a blood transfusion is given before, during, or after the operation and local anæsthesia is used whenever possible. Some individuals who agree that the abdominal route is the proper one for many patients with placenta prævia prefer the classic operation because they believe that a cervical operation is very complicated if the placenta is encountered before the baby is delivered. We have not found the operations done for placenta prævia much more difficult than usual. We prefer the cervical operation in these cases because we can easily inspect the placental bed. This is an advantage since not infrequently one or more large bleeding sinuses are seen. The bleeding from these can easily be checked by pursestring sutures. In the classic operation, these sinuses are not readily detected and the bleeding from them may prove fatal.

All 5 patients who had abruptio placentæ had a severe form of this disease and in 2 of them the uterus presented the typical picture of uteroplacental apoplexy.

The 5 patients who had heart disease were seriously ill and 2 of them were sterilized at the time the cæsarean section was performed. We believe that for a certain number of women who have cardiac decompensation during pregnancy, laparotrachelotomy under local anæsthesia (and morphin) is a life-saving operation.

The term dystocia dystrophia syndrome is applied to a group of troublesome patients whose chief characteristics are as follows. The women are usually heavy-set with masculine features. The external pelvic measurements are usually normal but the available space within the pelvis is smaller than normal and the extremities are short. The vagina is narrow and rigid and the cervix is short and firm. The patients have a tendency to develop toxæmia and to go beyond term. The position of the fetus is usually that of an occiput posterior and the fetal head remains above the pelvic inlet even after many hours of labor. When delivery is attempted from below, the result is frequently disastrous to the baby and injurious to the mother.

Repeated stillbirths is given as an indication for only two operations. However, 17 patients (14.5 per cent) in this series had previously had 26 dead babies, 3 of which had been delivered after craniotomy. Nineteen women (16.2 per cent) gave a history of having had 27 difficult operative deliveries exclusive of cæsarean section. The 2 patients who had tumors blocking the pelvis and the 2 who had had repeated stillbirths (due to dystocia) in reality should be added to the group with cephalopelvic disproportion, thereby raising the number to 81 (69 per cent).

DURATION OF PREGNANCY

In Table III the duration of pregnancy is listed. It will be seen that 87.1 per cent of the patients were at or beyond full term and that only 3.5 per cent of the operations were performed at the eighth lunar month or earlier.

TABLE III.—DURATION OF PREGNANCY

	Cases	Per cent	
More than 10 lunar months	17	14.5	87.1
10 lunar months	85	72.6	
9½ lunar months	5	4.3	
9 lunar months	4	3.4	
8½ lunar months	2	1.7	
8 lunar months	3	2.6	
7½ lunar months	1	0.85	
	117	99.95	

DURATION OF LABOR

Of the 117 patients, 67 (57.3 per cent) were in labor at the time the operation was performed whereas 50 (43.7 per cent) were not in labor. The duration of labor is shown in Table IV.

TABLE IV.—DURATION OF LABOR

	Cases	Per cent	
Not in labor	50	43.7	
In labor	67	57.3	
Less than 2 hours	2	1.7	
2 to 6 hours	12	10.3	
6 to 12 hours	15	12.8	43.6
12 to 18 hours	13	11.1	
18 to 24 hours	9	7.7	
24 to 36 hours	9	7.7	
36 to 48 hours	3	2.6	10.3
48 to 60 hours	2	1.7	
60 to 72 hours	2	1.7	3.4

It will be seen that 43.6 per cent of the 67 patients who had labor pains were in labor from 1 to 24 hours, 10.3 per cent from 24 to 48 hours, and 3.4 per cent from 48 to 72 hours, before the cæsarean section was performed. An explanation is necessary for the 50 patients on whom a cæsarean section was performed without a test of labor. The indications for these 50 operations are given in Table V.

TABLE V.—INDICATIONS FOR OPERATIONS WITHOUT TEST OF LABOR

	Cases
Previous cæsarean section	15
Cephalopelvic disproportion	12
Toxæmia	6
Heart disease	5
Placenta prævia	3
Eclampsia	2
Repeated stillbirths	2
Dystocia dystrophia syndrome	2
Abruptio placentæ	1
Tumor blocking pelvis	1
Three almost fatal postpartum hæmorrhages	1
	50

The 15 patients who had had previous cæsarean sections represent 65.2 per cent of the 23 patients who had previously been delivered by the abdominal route. The remaining 8 patients were in labor at the time of operation either because they were given a test of labor or because they entered the hospital after labor pains had begun.

It not infrequently happens that women with contracted pelves in whom the fetal head is high up and seemingly too large for the pelvic inlet have spontaneous deliveries. For this reason nearly all patients with contracted pelves are given a test of labor. The 12 women in the present series who were operated upon without waiting for labor pains had *in addition* to a contracted pelvis the following reasons for the operation before labor began:

1. Secundipara with fibroid uterus, breech presentation, and previous stillbirth due to dystocia.
2. Primipara with mitral insufficiency, dyspnœa, and tachycardia.
3. Secundipara 37 years old, who had had a stillbirth after high forceps delivery. Now overterm and medicinal induction of labor failed three times.
4. Primipara with diabetes mellitus and desire to be sterilized.
5. Primipara with fibroid uterus.
6. Unmarried primipara with marked stricture of vagina.
7. Secundipara who had had previous difficult high forceps operation resulting in stillbirth. Now overterm.
8. Secundipara who had had previous high forceps operation resulting in stillbirth. Medicinal induction of labor failed three times and attempt to induce labor by packing cervix with gauze also failed. Now overterm.
9. Primipara with breech presentation and narrow outlet.
10. Quintipara who had had three previous high forceps operations and one craniotomy.
11. Secundipara who had had previous craniotomy. Could not become pregnant until after trachelorrhaphy.
12. Primipara with contracted outlet.

No special explanation is necessary for the operations performed before labor began on the patients who had toxæmia, heart disease, placenta prævia, eclampsia, repeated stillbirths, abruptio placentæ, and a tumor blocking the pelvis. In both patients who had the dystocia dystrophia syndrome repeated attempts to induce labor medicinally failed, the head was definitely overriding the pubis, and one patient had previously had three spontaneous miscarriages. The patient who had had three almost fatal postpartum hæmorrhages, had had two transfusions. Her mother died from postpartum hæmorrhage and likewise one sister.

CONDITION OF MEMBRANES

In 82 instances (70.1 per cent) the membranes were intact and in 31 (26.5 per cent) they were ruptured at the time the cæsarean section was performed. In 4 cases (3.4 per cent) this could not be determined with any degree of certainty. The duration of time which elapsed between rupture of the membranes and operation varied from 30 minutes to 71 hours.

ANÆSTHETIC

The kind of anæsthetic used is shown in Table VI.

TABLE VI.—ANÆSTHETIC

	Cases	Per cent
Novocain alone	75	64.1
Novocain and general anæsthetic	8	6.8
Ether	29	24.8
Ethylene	5	4.3
	117	100.0

Novocain alone injected by direct infiltration sufficed in 64.1 per cent and in an additional 6.8 per cent, a general anæsthetic had to be added to complete the operation. Ether was used so many more times than ethylene because it was the anæsthetic of choice before we began to employ local anæsthesia. Ethylene was not introduced until after we had begun to use local anæsthesia extensively.

Most of my patients are given a hypodermic of morphin ¼ grain and magnesium sulphate 2 cubic centimeters about 15 minutes before the operation is started. Thus far I have not seen any bad effects on the baby and my experience leads me to believe that a baby rarely will show any harmful results from morphin given to its mother unless it is born within 1 to 3 hours after the morphin is injected. The morphin helps allay any fear the mother may have of the local anæsthetic; it lessens the pain due to the contractions of the uterus before the baby is delivered and also the pain which may be experienced during the closure of the wound.

STERILIZATION

Six patients (5.6 per cent of the 108) who had conservative cervical cæsarean sections were sterilized by means of an operation on the tubes. One patient was a primipara, 1 was a secundipara, 2 were tertiparæ, 1 was a quadripara, and 1 a quintipara. Three of the patients were sterilized after their first, 2 after their second, and 1 after the third cæsarean section. Sterilization was performed after the first operation for the following reasons. One patient was a quadripara, who had had two dead babies following forceps deliveries, one live child delivered by forceps, and two spontaneous miscarriages. The second patient was a tertipara who had mitral stenosis and insufficiency and was decompensated at the time of operation. The third patient was a primipara with a cephalopelvic disproportion and diabetes mellitus and she and her husband requested sterilization. The method of sterilization employed in all the cases was the Madlener procedure which consists of elevating the middle portion of each tube, crushing it gently but firmly with a smooth crushing clamp and then placing a heavy silk ligature in the groove made by the crusher. This operation is simple, rapidly performed, bloodless, and as certain as any other conservative procedure.

To the 6 cases of sterilization with retention of the uterus should be added the 9 Porro operations. These 15 cases represent a sterilization incidence of 12 per cent.

PORRO OPERATIONS

The 9 Porro operations among the 117 operations (7.7 per cent) were performed for the following reasons:

1. A quintipara, aged 34 years had had 4 normal deliveries. The indication for cæsarean section was mitral stenosis and insufficiency with decompensation during pregnancy. The uterus was amputated because of profuse menstrual periods, with severe pain requiring rest in bed.

2. A nonipara, aged 33 years had had 8 spontaneous deliveries. The Porro operation was done because the patient had an almost fatal abruptio placentæ and the uterus showed the typical picture of uteroplacental apoplexy.

3. A tertipara, aged 36 years had had 2 difficult high forceps deliveries. The second terminated in a rupture of the lower uterine segment.

4. A quadripara, aged 34 years had had 2 spontaneous deliveries. The operation was performed for abruptio placentæ and uteroplacental apoplexy.

5. A quadripara, aged 30 years had had 3 spontaneous deliveries, but each was followed by an almost fatal postpartum hæmorrhage. She was transfused twice. There were enormous varicose veins in the vagina and labia. Mother and sister died from postpartum hæmorrhage.

6. An undecipara, aged 40 years had had 10 spontaneous deliveries. Indication for operation was abruptio placentæ and toxæmia.

7. A quadripara, aged 38 years had had 3 previous cæsarean sections.

8. A quintipara, aged 37 years had had 2 previous difficult instrumental deliveries, 2 miscarriages, and 2 cæsarean sections.

9. A septipara, aged 35 years had had 6 spontaneous deliveries. Indication for cæsarean section was central placenta prævia.

The general consensus of opinion is that for the delivery of the baby preliminary to a Porro operation, it is better to make the incision in the body of the uterus rather than in the lower uterine segment. The reason given is that the former is more easily and quickly performed. In doing a Porro operation I prefer to make the first uterine incision in the lower uterine segment. After stripping the bladder down part way, instead of making a longitudinal incision, I make a transverse one high up in the lower uterine segment. This forms the first part of the line of amputation of the uterus. A Porro operation by this method should not require more time than a Porro following extraction of the baby through an incision in the body of the uterus. Since in most cases, local anæsthesia can be used, if not for the entire operation, at least for most of it, time is usually not a very important factor.

MORBIDITY

We consider as morbidity any elevation of temperature to 100 degrees F. or above even if recorded only once, from the time of delivery until the patient is discharged from the hospital. By this strict standard 58 patients (49.6 per cent) had morbidity distributed as shown in Table VII.

TABLE VII.—FEVER

Degrees F	Cases	Per cent
100 to 101	13	11.1
101 to 102	31	26.5
102 to 103	10	8.5
103 to 104	3	2.6
104.8	1	0.85
	58	49.55

In 26 of the 58 cases no cause for the elevation of temperature could be determined. A large number of these patients had only a mild or a moderate elevation. In Table VIII are listed the

causes of fever in the 32 cases where the etiology could be ascertained.

TABLE VIII.—CAUSE OF FEVER

	Cases	Per cent of 117 cases
Infected wound	11	9.4
Pyelitis and cystitis	6	5.1
Bronchitis	3	2.6
Mastitis	2	1.7
Pneumonia	2	1.7
Lochiometra	2	1.7
Sore throat	1	0.85
Peritonitis	1	0.85
Abscess from hypodermic	1	0.85
Bartholin gland abscess	1	0.85
Thrombophlebitis	1	0.85
Diabetes (?)	1	0.85
	32	27.4

Only 1 of the 11 wound infections was extensive and in this instance the patient refused to remain in the hospital after the eighth day because she insisted she was well enough to be up and about. The relatively large incidence of pyelitis and cystitis in this series of cervical operations and the relationship of these complications to the late toxæmias of pregnancy is discussed in my previous paper. In both cases where pneumonia developed, ether had been used as the anæsthetic. Diabetes is listed as a probable cause of fever only because the latter dropped precipitously after the use of insulin.

STAY IN HOSPITAL

The length of time the patients remained in the hospital is shown in Table IX.

TABLE IX.—STAY IN HOSPITAL

Days			
8	1	70 cases or 59.8%	98 cases or 83.8%
10	2		
11	9		
12	25		
13	14		
14	19		
15	13		
16	6	28 cases or 24%	
17	7		
18	2		
19	4	19 cases or 16.2%	
20	2		
22 to 28	11		
34	1		
43	1		

It may be seen that 59.8 per cent of the patients left the hospital within 14 days and that 83.8 per cent went home within 18 days. The fact that only 19 patients (16.2 per cent) remained in the hospital more than 18 days indicates that most of the febrile complications were not serious.

FETAL MORTALITY

Since there were no multiple pregnancies the total number of babies born was 117. There were five natal and neonatal deaths, making a fetal mortality of 4.3 per cent. Two of the 5 deaths were among the 108 conservative cæsarean sections (1.9 per cent) whereas the remaining 3 occurred among the 9 Porro operations (33.3 per cent). However, all of the latter babies were dead when their mothers were admitted to the hospital. All 3 mothers had abruptio placentæ. Since there were only two fetal deaths among the 114 babies who were alive at the time the cæsarean section was performed, the mortality for the live babies was 1.8 per cent. One of these babies died shortly after birth, the mother having been in labor 24 hours before the operation was performed. Autopsy failed to reveal anything but œdema and anæmia of the brain. The other baby, a monster, lived only a few minutes. Operation was performed for central placenta prævia.

HEALING OF CERVICAL SCARS

In most of the cases in which a laparotrachelotomy was repeated, I removed a piece of scar tissue for microscopic study. I also obtained pieces of scar tissue removed by my colleagues at the Chicago Lying-in Hospital. In a study of 37 of these pieces of scar tissue, Bloom and I (5) found that in most cases the wounds had healed very well and that even in the cases in which the scars were weak anatomically, they withstood the distention produced by pregnancy and the stress of labor. Since the report of our study, I have collected 21 more pieces of scar tissue and these bear out our belief in the strength of the scars in the lower uterine segment. As far as I know there has not been a single case of rupture of the uterus not only after my own 108 laparotrachelotomies but also after the entire series of almost 1,000 cervical operations performed at our hospital up to July 1, 1930.

ADVANTAGES OF THE LAPAROTRACHELOTOMY

The cervical cæsarean section has the following advantages over the classic operation. It has a lower mortality and a lower morbidity, it may be performed with safety after a relatively long test of labor, and it guarantees a much greater protection against rupture of the uterus in subsequent pregnancies and labors.

Our technique has been described in other reports (1, 2, 3) but I should like to emphasize the added advantages of using local anæsthesia not only for most conservative laparotrachelotomies but also for Porro operations.

SUMMARY

In a series of 108 conservative cervical cæsarean sections and 9 Porro operations after laparotrachelotomy there were no maternal deaths. Fifty-eight of the patients were primiparæ and 59 were multiparæ.

The chief indications for the operations were: cephalopelvic disproportion, 47 per cent; previous cæsarean sections with test of labor, 6.8 per cent; previous cæsarean sections without test of labor, 12.8 per cent; toxæmia without convulsions, 7.7 per cent; eclampsia, 1.7 per cent; placenta prævia, 6 per cent; abruptio placentæ, 4.3 per cent; cardiac disease, 4.3 per cent; and dystocia dystrophia syndrome, 3.4 per cent. In reality the total incidence of patients with cephalopelvic disproportion was 69 per cent.

Only 57.3 per cent of the patients were in labor at the time of operation and reasons are given for performing the operation on the 43.7 per cent who were not in labor.

The membranes were ruptured in 26.5 per cent of the cases at the time the operation was performed and the interval of time varied from a half hour to 71 hours.

Direct infiltration anæsthesia alone was used in 64.1 per cent of all the cases, in an additional 6.8 per cent a general anæsthetic was used with local anæsthesia, ether was employed in 24.8 per cent, and ethylene in 4.3 per cent of the cases.

Sterilization was performed in 5.6 per cent of the 108 conservative cases, and if the 9 Porro operations are added the incidence of sterilization was 12 per cent.

A temperature of 100 degrees F. or above was noted in 49.6 per cent of the cases and the chief causes in the cases in which the etiology was known were as follows: infected wound, 9.6 per cent; pyelitis and cystitis, 5.1 per cent; bronchitis, 2.6 per cent; mastitis, 1.7 per cent; pneumonia, 1.7 per cent; and lochiometra, 1.7 per cent.

In 59.8 per cent of the cases the patients left the hospital within 14 days and in 83.8 per cent they went home within 18 days.

The total fetal mortality was 4.3 per cent but of the 5 deaths, 3 occurred before the operation was performed. In these 3 instances the mothers had abruptio placentæ. Of the 2 remaining babies 1 was a monster associated with placenta prævia.

In most instances the wounds of the cervical cæsarean sections healed very well as proved by a microscopic study of pieces of scar tissue removed at the time of repeated laparotrachelotomies.

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Note.—Since submitting this paper I have done 23 additional conservative cæsarean sections without maternal or fetal mortality; hence the total number of operations to date is 140 and the total fetal mortality is 3.6 per cent.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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OCTOBER, 1931

PALLIATION IN CANCER

A NUMBER of articles have appeared recently in the literature directing attention to the medical treatment of cancer from the standpoint of palliation. These articles have been timely because of the tendency to consider cancer in its various stages as either hopeless or curable. The fact has been overlooked that great relief of symptoms and prolongation of life can often be afforded the patient with incurable cancer by treatment directed to these ends.

The medical treatment of cancer has been more or less neglected by the profession, because the merit of any method of treatment has been judged solely on the basis of permanency of cure. Sufficient consideration has not been given the effect of such methods in the control of distressing symptoms, particularly in the alleviation of pain. The various colloidal substances, notably lead (introduced by Blair Bell), arsenical preparations, tissue extracts and irradiation are or may be of palliative value and as such are worthy of continued investigation. If it is true that non-surgical treatment of cancer lessens suffering and prolongs life, the medical profession has been remiss in not judging methods of non-surgical treatment on their merits in this respect rather than in respect to cure.

From a surgical standpoint, increasing experience emphasizes the value of palliative measures. In cancer of the gastro-intestinal tract, for example, it is not uncommon to find that after removal of a primary malignant lesion, in cases in which known irremovable metastasis exists, the patient has been completely restored to general health, has lived in perfect comfort for a surprising length of time, and has then succumbed suddenly to invasion of other organs by neoplastic disease. This fact, however, should not minimize the importance of the widest possible removal of the growth and regional lymphatics.

No better example can be found of the value of palliative measures than in the surgical treatment of cancer of the stomach. It is unfortunately true that in many cases the disease has already extended beyond the possibility of cure when first seen by the surgeon. In such cases, however, the extirpation of the primary growth in the stomach, with removal of the adjacent lymph nodes, is often possible and frequently completely changes the clinical picture. Obstruction, when present or impending, is not only relieved, but the patient is protected against the development of any subsequent obstruction, provided the duodenal stump has been closed and a modified Billroth II type of operation is done. The patient's ability to take adequate nourishment means restoration of weight and general well-being, and extension of life in comfort is accomplished when other-

wise the patient would have succumbed to gradual obliteration of the gastric cavity and all the distress which it entails.

W. J. Mayo early directed attention to the fact that patients may live 2, 3, or 4 years in apparently perfect health, following removal of a cancer of the stomach, when metastasis was known to be present at the time of the operation. This is particularly true when the metastasis is in the liver, since this organ permits extensive invasion, if gradual and not accompanied by infection, without apparently affecting health.

A significant possibility in such intentionally palliative operations for cancer in any stage and in any situation is that cure may result when the accessible lymph nodes are removed even if inaccessible nodes are involved. There is reason to believe that cures may occur under such circumstances and this possibility demands consideration of those methods of treatment which might aid in preventing or controlling further extension.

For example, is it possible that lead, even though not suitable for the treatment of lesions of the gastro-intestinal tract, because of necrosis of the involved tissues, might be used after a primary growth is removed in the hope of bringing about a higher percentage of cures? The value of irradiation as an adjunct to surgical removal is as yet not definitely proved, but its further development should establish its usefulness in this respect.

Finally, in palliation the treatment of the patient is of paramount significance. Few are so constituted as to accept with equanimity a diagnosis of cancer. This being true it is the duty of the physician whenever possible to adhere to first precepts, that is, to alleviate suffering, even if this entails withholding knowledge of his condition from the patient, unless it becomes absolutely necessary or advisable to the best interests of the patient. Innumerable examples attest the wisdom of such practice. As Sir Frederick Treves has said, "In the face of misfortune, it is merciless to blot out hope." To create hope adds immeasurably to the happiness of the patient and consequently contributes to the prolongation of life and prospects of cure.

DONALD C. BALFOUR.

THE INTERDEPENDENCE OF PATHOLOGIST AND SURGEON

THERE is little doubt that dependence upon laboratory methods of diagnosis is a tendency in medicine which has been carried to dangerous extremes, but there is likewise little doubt that at least one phase of laboratory science has not been sufficiently emphasized, or, to put it more correctly, has not been sufficiently utilized. Examination of tissues by the pathologist is a practice with which, at least in theory, every physician is in hearty accord, but which he is inclined to overlook in the complicated routine of his life and in the face of the inconvenience which it often involves. And yet times without number his patient's health, his patient's life, hang upon the observance of this simple precaution.

I am moved to speak strongly on this subject, to urge the importance not only of the routine examination of all tissues but also of their complete examination, because of a tragic experience I have recently undergone. Some months ago I operated on a young woman for a simple adenoma of the thyroid, as I thought, which was grossly benign and which, on immediate and deferred microscopic study, was reported back to me as microscopically benign. Eight months later she returned with an inoperable malignancy of the gland which involved the larynx and

all adjacent structures. The pathologist, in checking back the specimen submitted to him at the first operation, found that malignancy had existed then, that the proper number of sections had been made, but that in some unaccountable way those areas of the specimen which exhibited the malignancy had not been examined at all. He has a careful technician, he is a competent and a conscientious pathologist, I have relied on his judgment many times in the past, and yet this irreparable mistake was made.

If this sort of thing can happen with a competent pathologist, it is easy to conceive of the tragedies which can result if he is careless or incompetent. The contention of Cullen, Bloodgood, and others that the surgeon should be his own pathologist by no means solves the problem. That he should have a comprehensive knowledge of gross pathology, that he should have at least a superficial knowledge of microscopic pathology, are facts beyond dispute. But that he should possess the detailed knowledge of histopathology essential for the diagnosis of the borderline case and the early case, the cases which confuse and bewilder the most expert, is for the average man simply out of the question. If he possessed such knowledge the chances are that he would be a pathologist, not a surgeon, or that hoary age would overtake him before he had mastered both specialties.

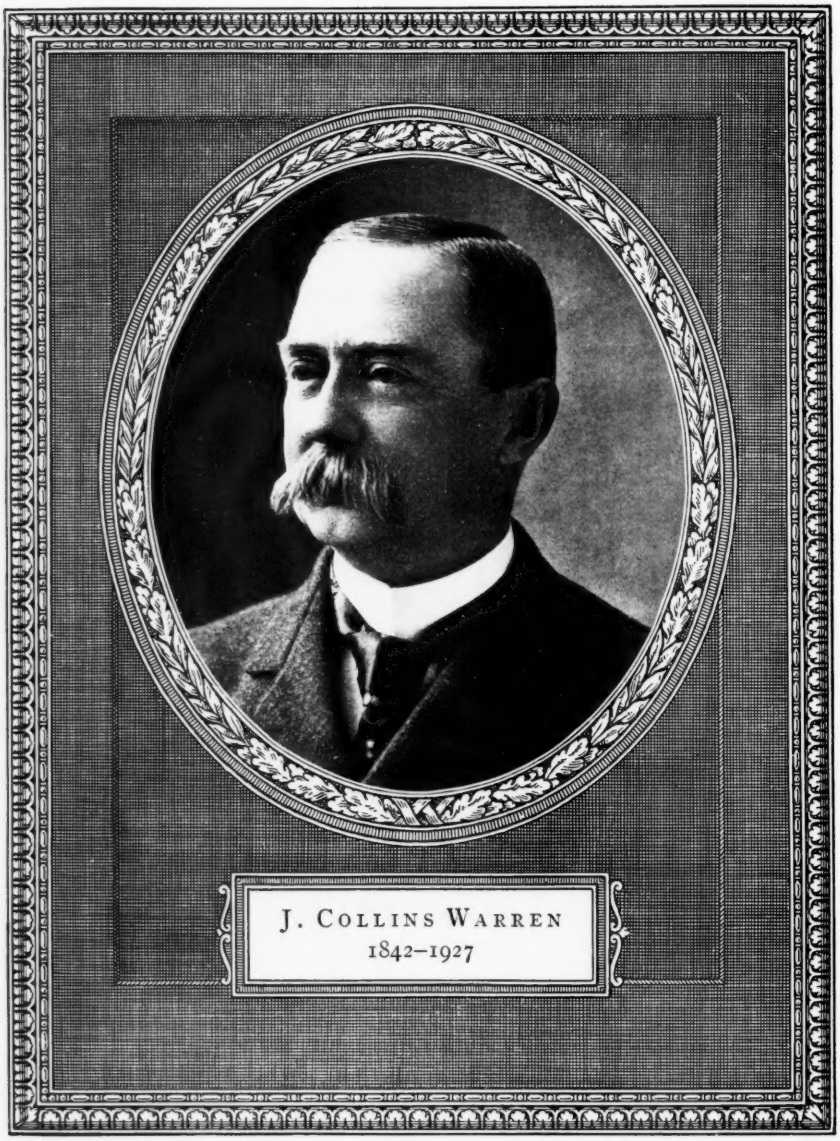
In all but the most exceptional cases the surgeon must depend upon the pathologist, must accept his decisions, must base his course of action upon them, and only a surgeon, and a conscientious surgeon at that, realizes how much is at stake every time he calls him into consultation. The conscientious pathologist, on the other hand, is equally aware of the responsibilities he carries, knows full well that the outcome of very many cases is quite as much in his hands as in the hands of his surgical associate. It follows, therefore, that he must be a highly trained man and an exceedingly careful man, for an untrained or a careless pathologist is the most dangerous of all conscienceless physicians. He should be—though he often is not—a well paid man, for a cheap pathologist is the falsest of all false economies. He must be a studious man, for his branch of medical science does not stand still. These are exacting standards, but we cannot afford to lower them; on their strict observance the issues of life and death hinge.

The ideal, of course, is such a laboratory group as that headed by Ewing or that headed by MacCarty, distinguished leaders of distinguished followers, but such groups can scarcely be duplicated in the world, certainly not in the average hospital. The best that we can do, therefore, is to use to the fullest the laboratory facilities at our command, to supplement them and round them out as circumstances, particularly financial circumstances, permit, and to insist that the personnel of the department include only trained and competent men. The real efficiency of any hospital is measured by the efficiency of its pathological laboratory. We can likewise insist that this department be located either within the operating suite or so closely adjacent to it as to be an integral part of it, so that the examination of specimens can be done without loss of time, without undue prolongation of the anæsthesia, without the confusion which a request for immediate diagnosis only too often produces in the average hospital. We can insist that the pathologist or a competent assistant be within call every time surgery is done; the calls of the surgical staff constitute the emergencies of the laboratory, just as a ruptured appendix or a fractured skull or a gunshot wound con-

stitutes the emergencies of the surgeon. We can insist that all specimens removed at operation, regardless of location, regardless of gross appearance, regardless of the desires of the surgeon or the wishes of his patient, be sent to the laboratory for examination, and that a system be in effect which makes such a routine inevitable. We can insist that specimens not only be examined routinely but can insist that they be examined comprehensively as well, so that such a tragedy as the one I have just recounted cannot possibly occur.

If we do these things, if we teach our internes and our nurses the importance of doing these things, we can comfort ourselves with the thought that however limited our facilities may be, our patients are adequately protected against carelessness and against error, at least as far as human precautions can protect them. For in malignancy of any type the most expert treatment avails nothing in comparison with the importance of an accurate diagnosis and an early diagnosis. And such a diagnosis, because it is possible only by the microscope and by the trained eye, is the responsibility of the pathologist almost more than it is the responsibility of the surgeon who submits the specimens to him.

URBAN MAES.



J. COLLINS WARREN
1842–1927

MASTER SURGEONS OF AMERICA

JOHN COLLINS WARREN

ON the third day of November, 1927, there died in Boston, Massachusetts, a surgeon, whose life and whose works were of such a character as to entitle his memory to far more than ordinary consideration and respect. This surgeon was Dr. John Collins Warren.

He came of distinguished ancestry, and belonged to a line of eminent doctors of five successive generations, reaching far back to Revolutionary times:

1. His great-grandfather, Dr. John Warren (1753–1815)—younger brother of General Joseph Warren (also a doctor), who at the head of the American forces, fell at Bunker Hill—was a hospital surgeon in the Revolutionary Army, and was the first professor of anatomy and surgery in Harvard College. He was one of the founders of the Harvard Medical School, and also of the Massachusetts Medical Society. He was furthermore a prominent citizen deeply interested in public affairs.

2. His grandfather, Dr. John C. Warren (1778–1856), was also in turn professor of anatomy and surgery at Harvard, and with Dr. James Jackson, took an active part in the founding of the Massachusetts General Hospital, which was first opened in 1821. He it was, who at the hospital in 1846, gave the first public demonstration of the use of ether as a surgical anæsthetic—removal of a tumor of the neck—Dr. William T. G. Morton himself being the anæsthetist.

3. His father, Dr. Jonathan Mason Warren (1811–1867), was one of the surgeons at the Massachusetts General Hospital, and he also took a prominent part in the surgery of his time in Boston.

4. Dr. John Collins Warren, was of the next generation; and following him came:

5. His son, Dr. John Warren, who was associate professor of anatomy at Harvard, and also University marshal from 1911 until the day of his death, July 17, 1928.

The subject of this sketch, Dr. John Collins Warren—or, as he was in the habit of writing his name, "J. Collins Warren,"—was born in Boston, May 4, 1842; and was the son of Dr. Jonathan Mason Warren, as already related, and his wife Annie (Crowninshield) Warren.

John Collins Warren acquired his early education at the Boston Latin School,

and later attended a private school in the same city. He graduated from Harvard College in 1863; from the Harvard Medical School in 1866; and then, after taking a course at the Jefferson Medical College in Philadelphia, continued his studies in Europe for about 3 years,—principally in London and Edinburgh, Paris, Berlin, and Vienna.

On his return to Boston he at once began the practice of his profession, and was soon appointed surgeon to out-patients at the Massachusetts General Hospital. He served in that institution for 36 years, being promoted from one grade to a higher one until finally he became senior visiting surgeon.

Being desirous of teaching as well as practicing surgery, he fortunately soon received an appointment as instructor at the Harvard Medical School, and thereafter he was rapidly advanced through the various grades until he became Moseley professor of surgery, finally retiring with the title of professor emeritus. His wide experience both in the practice of surgery and in teaching, naturally increasing as time went on, added greatly to his efficiency in both of these directions. His private practice and his consultations, also grew in accordance.

He was a prolific writer on many different surgical subjects. One of his earliest successes in this respect was the winning of the prize in 1872 for his Boylston medical essay on "Rodent Ulcer." Throughout his professional life he was always intensely interested in surgical pathology, and he was one of the first in this country to employ systematically the microscopic examination of pathological material removed at operation. Everything relating to malignant tumors particularly appealed to him, and he wrote many papers on this subject. In 1895 he published a book entitled *Surgical Pathology and Therapeutics*, embodying the most approved ideas of that time. This book has been called "his most notable literary accomplishment." Later he contributed the chapter on "Surgical Pathology" in Keen's *American Text-Book of Surgery;* still later, with Pearce Gould, the well-known English surgeon, he became co-editor, and in part author, of the *International Text Book of Surgery*, which was published in two volumes. For a number of years he was also editor of the *Boston Medical and Surgical Journal.*

He was a Member of the American Surgical Association, and, at one time, President; he was one of five upon whom honorary fellowships were conferred by the American College of Surgeons at its first meeting; he was a member of the American Medical Association, of the Massachusetts Medical Society, and of the College of Physicians of Philadelphia. He was also chairman of the Harvard Cancer Commission for nearly 25 years. For more than 12 years he was also president of the Massachusetts Eye and Ear Infirmary.

He had unbounded faith in the unusual opportunities in Boston for the extensive development of medical teaching and research, and a large part of what has been accomplished in this direction was due to him. He was always

intensely interested in the welfare of the Harvard Medical School, and was ever ready to help it in every way possible; and his work for the School, continued over many years, was unremitting and of enormous benefit. He, with Dr. Henry P. Bowditch, not only originated the ideas upon which the plant of the present Harvard Medical School was planned, but together they did notable work in securing the necessary funds for carrying their ideas into effect, and in attracting to the vicinity a number of hospitals and other institutions allied in one way or another to medicine, and thus developed what up to that time was new and was much needed in Boston—a great Medical Center. This result was largely due to Dr. Warren's persistent exertions, and to his firm conviction as to the worthiness of his cause. To him also belonged the credit for making it possible to build the Collis P. Huntington Memorial Hospital, and to equip it for work in the study and treatment of cancer. He moreover directed his efforts toward securing for medical students suitable dormitory accommodations; and, before he died, he had the satisfaction of knowing that this dream had become true in the building of Vanderbilt Hall.

He was awarded an Honorary LL.D from Jefferson Medical College (in 1895) and later, the same from Harvard, and also from McGill. In 1900 he received the honorary degree of fellowship in the Royal College of Surgeons of England, and somewhat later a similar honorary degree in the Royal College of Surgeons of Edinburgh.

As might be expected, Dr. Warren had also many interests outside of medicine; among them being the Massachusetts Historical Society, to which, by will, he left forty-six volumes of the papers of the Warren family for five generations (from Revolutionary times). He was also a member and past president of the Bunker Hill Monument Association, and of the Humane Society of Massachusetts, and a fellow of the American Academy of Arts and Sciences. From 1908 to 1914 he was an Overseer of Harvard University.

Such is a mere outline of the life and activities of the man, who did such memorable service for Harvard University, for the Harvard Medical School, and for medicine and surgery. It has been said of him by an intimate friend, most competent to judge, that he was one of the few men whose background and foreground were in perfect accord; for, not only did he belong to a distinguished family, but what he himself stood for and what he himself accomplished were worthy of a prominent place in the history of that family. While occasionally the possession of distinguished forebears seems to discourage initiative in some of the younger members of a family, nevertheless in other instances it appears to act as a definite stimulant. This latter was probably true in Dr. Warren's case. With such a thought in his mind it is easy to see how he dreamed dreams, and how he later experienced what must have given him the keenest pleasure, not only in seeing his dreams realized, but in possessing the knowledge that he had

done his full share in changing them into actual being. And yet modesty was a marked characteristic of Dr. Warren, for his thoughts seemed to be directed principally toward what there yet remained for him to do, rather than toward what he had already done.

One cannot close this short sketch without reference to Dr. Warren's attractive personality which carried with it a suggestion of the old school. Although so often deeply engrossed in serious thoughts for the betterment of one medical interest, or another, he possessed a genuine gaiety of spirits, was a prince of good company, and was beloved by all who knew him.

In recognition of his notable services there was placed, after his death, in the Warren Museum at the Harvard Medical School, a marble bust of him by the sculptor, Paramino. There it may be seen—a fitting tribute to his memory—in the honorable company of his distinguished ancestors!

GEORGE H. MONKS.

NICOLAI MASSÆ
VENETI ARTIVM ET MEDICINÆ
DOCTORIS EPISTOLÆ MEDICINALES, ET

Philoſophicæ, elegantiſſimæ ad omnes fere morbos nuperrime editæ, in quibus quamplurima ſcitu digna de ordinandis intentionibus in conſultationibus, & collegijs, inter medicos. Ac curandis ſingularibus morbis, & in anatomicis diſſectionibus. Ac etiam de dialectica, & philoſophicis rebus dubijs quædã conſcripta ſunt, vt ſtudioſo lectori patebit. Opus ſanè non tantũ medentibus iucundũ, & perutile, verum etiam ſtudioſis omnibus alijs.

Nicolaus Rontana Braſilichenſis ad lectorem.

Abdita ſacratæ medicinæ diſcere quisquis
Optarit præſens utile carpat opus.
Irrita tela Deæ ſunt iam, cœliq́, minæq́,
Conſilio cum ſit, qui leuet omne malum,

Ne quis impune libellum hunc imprimere audeat Priuilegiis cautum eſt.

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

ALFRED BROWN, M.D., F.A.C.S., OMAHA

THE LETTERS OF NICOLA MASSA

SURGICAL progress during the sixteenth century is inseparably linked with the increase in anatomical knowledge which was gained during that period. Consequently, though their surgical skill may not have been great, one must accord to the anatomists of the period considerable credit for advances made by others in surgery and surgical technique. The great change in anatomy was made by Vesalius who, through the agency of Jan Stephan Kalkar, a pupil of the great artist Titian, raised anatomical illustration from the cave man type of art of the broadside and fugitive sheet to an art comparable to the best then known, and so gave to the world an accurate visual image of the construction of the human body. Many of the points to which Vesalius called attention by his illustrations and accompanying text had been moot questions for years among anatomists who did not have the genius of Vesalius for demonstration and had called attention to them by the written word only and had neglected the most important visual image.

Nicola Massa was one of these pre-Vesalian anatomists who lived in Venice during the early part of the sixteenth century and died there, according to Gurlt, about 1569. His published works were on many subjects and his work in anatomy and surgery fell rather in the background possibly because his work on syphilis, which disease was then attracting much attention, proved so popular that it went through four editions in thirty-one years. His *Anatomy* published first in 1536, four years after his book on syphilis, bore the title *An Introductory Book of Anatomy* and his letters, *Epistolæ Medicinales*, appeared in its first edition six years later in 1542.

Massa's anatomical knowledge was considerable, and the fact that he was not given proper credit for it disappointed him greatly and he laid the blame for this at the door of illustration in anatomy. He wrote two letters with reference to anatomy to his friend Antonio Francanzane of Pavia. In the first one dated January 20, 1543, he calls attention to his previous descriptions of the membranes of the brain, the gray and the white matter, and the olfactory lobes of the brain with their nerves to the nasal mucous membrane and attributes to them the sense of smell. In the second letter dated January 23, 1543, he again refers to the nasal nerves and also refers to his discovery of the nerves to the muscles of the tongue both of which he demonstrated by first macerating the tissues. He says "For the tongue substance (as I have said) evidently does not lack nerve parts mixed with flesh to its final part, as one can see from the passage of filaments which proceed through the fleshy substance which are demonstrated especially when they (the tissues) are macerated and have become almost putrid, or when they have been stewed or cooked in much water."

He thus antedated many of the discoveries which were published and popularized later by the anatomists of the Vesalian school and those who came shortly after. In retrospect it would seem that his disregard of illustration had a good deal to do with the lack of appreciation of his work.

Massa did not stop with the cranial nerves in his anatomical research. He noted vessels, probably lymphatics, passing upward from the orifices of the renal vessels. He differed, in his description of the liver, from the previous conception of a multilobed organ as depicted in the fugitive sheets and described the liver as consisting of two lobes separated by an incomplete septum.

Massa's most important anatomical contribution so far as its bearing on surgery is concerned was his description of the peritoneum and the technique of evisceration. This is contained in his *Introductory Book of Anatomy* published in Venice in 1536, 1559, and 1594. After describing the technique, he proceeds to the surgical side of the question. He advised washing intestines protruding through a wound with warm wine, then enlarging the wound and replacing the gut after the wounded intestine is sutured. An interesting point is that in his abdominal operations he used metal retractors. He says, after describing how the wound is enlarged with a blunt pointed instrument, "which instrument the best operators add the fingers or plates of silver or brass." He differs from Hippocrates' dictum that wounds of the small intestine are always fatal and after reading his description of his technique of intestinal suture one can see that, barring infection, his patient had a good chance to recover.

Massa did not have much use for contemporary illustrated anatomical works and, as the letter in which he refers to them was written in January, 1543, he probably means the Vesalian plates published in 1538, for neither the *Epitome* nor *Fabrica* had then been published. Great anatomist and surgeon as he was he overlooked the value of illustration.

REVIEWS OF NEW BOOKS

THE fifth edition of Lovett's book[1] was revised and edited by his two colleagues and successors, Ober and Brewster. Their purpose was to perpetuate the fundamental contributions of their illustrious teacher. The etiology, diagnosis, and treatment of Lovett's work on scoliosis is of great practical importance. Some new valuable material which includes the Galeazzi method of treatment and detailed descriptions of the turnbuckle jacket and the turnbuckle-shell treatment has been added. This book is the best book on the subject at the present time. It is highly recommended to medical and physical education students, physical therapists, pediatricians, and orthopedic surgeons.

PHILIP LEWIN, M.D.

LIEPMANN'S book[2] on gynecology was written with the thought in mind of producing a "really useful textbook for physicians as well as students." The reader is at once most favorably impressed by the fact that this work does not follow the orthodox and too often uninteresting form of the average textbook but rather is written in a most informal and interesting manner. The entire subject of gynecology is covered in fifteen lectures, each on one field of this specialty in addition to two lectures on the economic, sociologic, and psychologic aspects of gynecology. The book is written in the inimitable style which characterizes all of Liepmann's publications and is most admirably and profusely illustrated. He presents case histories having to do with every type of gynecologic pathology and in the subsequent discussions brings out all of the newer and recognized developments in gynecology such as perturbation, hysterosalpingography, Aschheim-Zondek tests, etc.

The author has been one of the pioneers in Germany in the development of "Soziale Frauenkunde" for which there is no English equivalent phrase but which includes a study of psychology, sociology, and economics as they pertain to gynecology together with a study of birth control, contraception, and sterility plus fertility. The two chapters covering these subjects should be of interest to American gynecologists as they present so completely the results of the German studies along these lines as well as the present German views.

Liepmann has intentionally omitted all discussions of radiation technique as he feels that this belongs to radiology, a specialty in itself. He has omitted practically all illustrations of microscopic studies—for these the reader is referred to standard texts on pathology. He has also given no bibliography although he quotes freely from the literature, past and present. For bibliography the reader is referred to the larger works on gynecology such as Halban-Seitz, etc. If more of the modern German authors would adopt this attitude and thus do away with the constant repetition of cumbersome bibliographies which at best are incomplete, more of the textbooks from Germany could be kept down in size and price and thus be more usable than at present. Liepmann's *Seminar* is complete and yet has been kept within what should be normal size and price. It is a volume in which all gynecologists should be interested.

RALPH A. REIS, M.D.

THE atlas[3] on the anatomy of the ear by Belou consists of a collection of loose leaflets, 236 in all, representing illustrations of the anatomy of the organ of hearing, placed on cards and many of them are arranged for study with the stereoscope. The volume represents a comprehensive presentation from illustrations of dissections of the complicated structures which comprise the organ of hearing. What text there is, is in Spanish but the illustrations of the dissections need very little text as they speak for themselves.

GEORGE W. SHAMBAUGH, M.D.

KAPLAN set forth in his excellent working manual,[4] the indications, technique, and results of radiation therapy as practiced at Bellevue Hospital. Holfelder's method of cross-fire irradiation, the partitioning into small, repeatedly administered doses of roentgen irradiation, according to Solomon, and Regaud's method of employing small doses of radium, heavily filtered, over a considerable period of time, all find their expression in the author's practice. On the whole, in spite of the brevity of the text, the book constitutes a very satisfactory guide to radiation therapy, not only in cancer but in the rather numerous benign conditions in which radium and the roentgen rays have proved of value.

JAMES T. CASE, M.D.

THE second half of volume five of Veit's *Handbuch der Gynaekologie*[5] is a 750 page volume written by Ludwig Nuerenberger of Halle, on the "Diseases of the Vagina." The work is encyclopedic in character and includes practically everything that has been written on the physiology and pathology of the vagina. It is in outline form and very simply written. The illustrations are good,

[1] LOVETT'S LATERAL CURVATURE OF THE SPINE AND ROUND SHOULDERS, 5th ed. rev. and edited by Frank B. Ober, M.D., and A. H. Brewster M.D. Philadelphia: P. Blakiston's Sons & Company, Inc., 1931.

[2] DAS GYNAEKOLOGISCHE SEMINAR; PRAKTISCHE GYNAEKOLOGIE MIT BESONDERER BERUECKSICHTIGUNG DER SOZIALEN FRAUENKUNDE. By Wilhelm Liepmann. Berlin and Vienna: Urban and Schwarzenberg, 1931.

[3] ATLAS DE ANATOMÍA DEL ORGANO DEL OÍDO Y DE LAS REGIONES CON EL VINCULADAS. By Dr. Pedro Belou. Buenos Aires: Gráfico Oceana, 1930.

[4] PRACTICAL RADIATION THERAPY. By Ira L. Kaplan, B.S., M.D. With a Special Chapter on Applied X-Ray Physics by Carl B. Braestrup, B.Sc., P.E. Philadelphia and London: W. B. Saunders Company, 1931.

[5] VEIT'S HANDBUCH DER GYNAEKOLOGIE. 3d rev. enlarged edition. Edited by W. Stoeckel and collaborators. 1st half vol. v—ERKRANKUNGEN DER SCHEIDE. By Ludwig Nuerenberger. Munich: J. F. Bergmann, 1930.

many of them being in color, but portions of the book are inadequately illustrated. There is a marked overemphasis of the sections on physiology, the sections on laboratory procedures, and the sections dealing with the theoretical discussions. On the other hand, the portions of the book which are devoted to the clinical aspects of the diseases of the vagina might have been elaborated upon and more completely written. This is true of the handling of the sections on therapy throughout the book and especially true of the discussion of the treatment of malignant tumors of the vagina—to the reader this leaves much to be desired. However, the volume, being so nearly complete and containing as it does a full bibliography of the world literature on the subject, should make an excellent reference work on diseases of the vagina. In this respect this volume is in keeping with the two volumes of this series previously reviewed. The author has made this volume a handy one to use as a reference work, because in addition to the complete bibliography at the end of the volume, the references to the text are found at the bottom of each page. RALPH A. REIS, M.D.

AN Introduction to Gynecology[1] is exactly what its name implies. The book was written primarily for third year medical students and is an outgrowth of a series of notes which the author has used for some time. The book is well written, each subject being presented simply, clearly, and briefly—so briefly in fact that many chapters seem incomplete even for third year students. This work with supplementary reading should prove to be a desirable and usable book for students.

RALPH A. REIS, M.D.

THE Michons have presented a very practical exposition of their experience in the diagnosis and treatment of diseases of the genito-urinary tract in their recent book on urology.[2] The book is designed as a critical analysis and summary of an extensive personal experience without reference to the literature or the discussion of methods not acceptable to the authors. The book is well illustrated and there are some points in surgical technique which appear unique and original. VINCENT J. O'CONOR, M.D.

THE pattern after which textbooks of pathology have been compiled has not been materially changed since it was established by Matthew Baillie's *Morbid Anatomy* in 1793. The present volume, *The Pathology of Internal Diseases*,[3] by William Boyd, professor of pathology in the University of Manitoba, is a definite attempt to break the "cake of custom" which has interfered with the potential usefulness of pathological material for clinical teaching. This volume is neither a textbook of pathology nor one of internal medicine but it bridges the gap between these two subjects. It should stimulate the interest of practitioners of medicine in postmortem examinations. It will also point the way by which pathologists may become effective clinical teachers. Pathology is a science in itself and worthy of study for itself alone but pathology as a pure science has little interest to either the practitioner or the medical student. It is only when pathology is brought into definite relations with clinical medicine that the internist and general practitioner will take a real interest in the subject, much to their own and their patient's advantage.

Dr. Boyd's book is well calculated to stimulate such interest. The subject of pathology is taken up according to organs and systems of organs so that the bare skeleton outline does not differ materially from the outline of the ordinary textbook of special pathology. That which especially distinguishes the book is the inclusion, under the discussion of each of the various pathological lesions described, of one or more paragraphs detailing the relation of symptoms to lesions. Thus after describing clearly and without unnecessary verboseness the pathological changes which accompany a disease, the author explains how these pathological changes give rise to the symptoms and physical signs by which the disease manifests itself clinically.

To the pathologist this volume should bring a new point of view and enable him to engage more effectively in the highest type of clinical teaching. To the internist it should be a constant reminder that symptoms and physical signs rest upon a foundation of pathologic change, and that he can still learn much at the autopsy table if he approaches it in a state of mind which this volume should produce in him. To the medical student it should be a useful aid in filling the "gaps that the ordinary textbooks leave vacant." J. P. SIMONDS, M.D.

REED'S book[4] is the first in English to be devoted to obstetric work done on the manikin. It is well written and easy to read. The various steps in each maneuver are explained minutely. The author feels that, since labor is becoming more and more a pathological process, this book will fill a need. It is intended as a guide for the undergraduate who aims to do general work, but it is likewise useful for the specialists. It is a useful textbook.

E. L. CORNELL, M.D.

THIS treatise by Lacassagne[5] is an excellent and concise statement of radiotherapy at the Radium Institute of Paris. The treatise may be divided into two parts: first, the general mechanics of radium with brief reference to biological effects; and second,

[1] AN INTRODUCTION TO GYNECOLOGY. By C. Jeff Miller, M.D. St. Louis: The C. V. Mosby Company, 1931.

[2] PRATIQUE UROLOGIQUE CHIRURGICALE. By Ed. Michon and L. Michon. Paris: G. Doin et Cie, 1931.

[3] THE PATHOLOGY OF INTERNAL DISEASES. By William Boyd, M.D., M.R.C.P. (Ed.), Dipl.Psych., F.R.C.S. Philadelphia: Lea and Febiger, 1931.

[4] OPERATIVE OBSTETRICS ON THE MANIKIN; FOR STUDENTS AND PRACTITIONERS. By Charles B. Reed, M.D., F.A.C.S. Philadelphia: P. Blakiston's Son & Company, Inc., 1931.

[5] NELSON'S LOOSE-LEAF LIVING SURGERY. Radium Treatment of Cancer at the Curie Institute. By A. Lacassagne, New York: Thomas Nelson & Sons, 1931.

a description of the technique used in various lesions amenable to radium treatment.

The first part deals briefly, but effectively, with the action of radiation on cancerous tissue and discusses radiosensitivity of carcinomata. The relationship between sensitivity and radium technique is discussed with reference to screening, which is heavier than was formerly used; the duration of treatment, small amounts of radium over a long period of time having superseded shorter applications; and last, total dosage is discussed.

The second half of the treatise is comprised of discussions of the various lesions amenable to radium therapy, such as cancers of the skin, oral cavity, and female genital tract. Illustrations are numerous portraying the various methods of application. A survey of the end-results shows that 90 per cent of cancers located on the nose and lower lip are amenable to cure by radiotherapy. The percentage drops markedly as the lesion becomes more difficult of access on account of anatomical location.

Breast carcinoma is treated but little in this Institute, most cases being referred to other institutions where surgical measures seem to be the method of choice. This is in marked contrast to the viewpoints of the English surgeons, if one is to judge by the literature from English sources.

Other lesions such as sarcomata and the leukæmias are discussed in proportion to their importance.

The simple, straight-forward manner in discussing the subject together with the illustrations and references to results makes the text one which should appeal to all physicians and especially to the radiation specialist. A. JAMES LARKIN, M.D.

THE work by Piersol[1] has occupied an enviable place among American textbooks for 25 years and its present appearance in the form of a ninth edition attests to a continued popularity which is well deserved. Piersol's remains the most ambitious work on human anatomy yet attempted in the new world. Moreover, except for the exhaustive, many volumed system begun under Bardeleben's leadership and still unfinished, it probably has no superior in any language for comprehensiveness, clarity, and wealth of illustration.

To our mind it approaches the ideal book for an English speaking medical practitioner to have at hand for reference, since all reasonable anatomical details, as well as practical considerations are included. The chief weakness is the lack of vigor in the illustrations. For students in course Piersol is also invaluable as a reference source through which many smaller points find explanation. With the great reduction in the time allotted to the teaching of human dissection, it is, however, somewhat unwieldy and discouraging to the present day student. The real need at the present time is for two kinds of anatomical texts. One is a brief, well illustrated book of essentials which will give to the medical student a comprehensive view of anatomy, consonant with the time available and the type of course nowadays pursued. Such a text does not exist. The other is a work which can not only be used for special reference throughout the student medical years but which will also serve as an authoritative source and life-long companion to the mature student either in practice or out. This need Piersol meets adequately.

The ninth edition has passed to the editorship of Professor G. Carl Huber, who has been aided by his staff at the University of Michigan. The practical considerations have been revised by Dr. E. G. Eliason, professor of clinical surgery at the University of Pennsylvania. Chief in importance among the changes is the introduction into the text of a consistent and uniform B. N. A. nomenclature. Other revision is confined largely to sections dealing with the histogenesis of the blood elements, the development of the lymphatics and primary veins, the peripheral nervous system, and particularly the sections dealing with fiber tracts of the central nervous system. A few figures replace earlier illustrations and a few new ones have been added. The sequence of figure numbers and the pagination, however, remain the same as in the previous edition.

L. B. A.

EVERY teacher of roentgenology will appreciate the value of Holmes' textbook[2] on roentgen interpretation, so concise and yet so rich in facts and illustrations. The paper is excellent and with very rare exceptions the illustrations depict very clearly the lesion which they are intended to show. Really there is an astonishing number of pathological processes susceptible of X-ray demonstration illustrated in this brief work. There are a number of valuable tables of comparative X-ray findings. The bibliography is useful. All the newer methods of investigation are included, such as Graham's test for gall-bladder disease, encephalography, and the use of uroselectan and other substances for intravenous pyelography. The book should be of great practical value to all medical practitioners whether or not they are engaged especially in roentgen-ray diagnostic work. JAMES T. CASE, M.D.

THIS third edition[3] with 39 colored illustrations on 20 plates and 123 figures in the text, has as its foundation, the work of Henry Butlin which for 45 years has been the leading textbook on diseases of the tongue. Later advances in treatment have been added, especially the use of radium has been exhaustively discussed.

The importance of oral hygiene and the evils of oral sepsis are quite fully discussed.

[1] PIERSOL'S HUMAN ANATOMY; INCLUDING STRUCTURE AND DEVELOPMENT AND PRACTICAL CONSIDERATIONS. 9th ed. Revised under the supervision of G. Carl Huber, M.D., Sc.D. Philadelphia, Montreal, London: J. B. Lippincott Co., 1930.

[2] ROENTGEN INTERPRETATION; A MANUAL FOR STUDENTS AND PRACTITIONERS. By George W. Holmes, M.D., and Howard E. Ruggles, M.D., 4th ed. rev. Philadelphia: Lea and Febiger, 1931.

[3] DISEASES OF THE TONGUE. By Walter G. Spencer, M.S., F.R.C.S., and Stanford Cade, F.R.C.S. 3d. ed. of Butlin's DISEASES OF THE TONGUE. London: H. K. Lewis & Co., Ltd., 1931.

At the end of each chapter is a bibliography citing authoritative articles on each subject discussed. As Butlin's *Diseases of the Tongue* was the best textbook on the subject, and as it has been out of print for 30 years, this book, will no doubt, meet with a well merited reception. H. A. POTTS, M.D.

THE book[1] on brain tumors by Ernest Sachs is the first attempt on the part of a neurological surgeon to present the surgery of intracranial tumors in a volume suited to the entire medical profession. All of the contributions to the advancement of neurological surgery, so many of which have come from this country, have been in the form of monographs upon special topics in this field of surgery.

Dr. Sachs' task was a difficult one but he has succeeded admirably in presenting his material in a concise manner. He would be the first to admit that his book does not cover each group of intracranial tumors completely. As a matter of fact, monographs have been written upon one particular group of intracranial tumors in one particular location. The average doctor, however, is not inclined to obtain the information he desires about intracranial tumors from a group of monographs. Consequently, this book will serve a very definite need and will be one of the means of acquainting the practitioner with what may be accomplished in the treatment of intracranial tumors.

ECKSTEIN'S biography[2] of the great Japanese scientist, Hideyo Noguchi, depicts the splendid achievements of this remarkable Oriental bacteriologist, with his Oriental point of view, dropped suddenly into the turmoil of Occidental surroundings. It is a narrative of great discoveries, beginning with serological studies of snake venom, and continuing logically to syphilis, poliomyelitis, yellow fever, verruga peruana, Rocky Mountain spotted fever, and trachoma, together with other investigations, less striking but hardly less important. It is admirably told, in a manner that reflects the restless genius of Noguchi. A. I. KENDALL, M.D.

ASHHURST has displayed sound didactic instinct in laying emphasis on the underlying principles, on pathogenesis, diagnosis, and treatment in the fourth edition of his *Surgery*,[3] which has been brought up to date by a thorough revision of its subject matter and inclusion of such new matter as has accumulated in recent years. It is a thoroughly satisfactory textbook of surgery for both students and practitioners. The reviewer is impressed by a certain freshness and vigor of style reflecting as it does the wide personal experience of the author, both as a surgeon and as a frequent contributor to surgical literature. GEO. HALPERIN, M.D.

THE popularity of Romanis and Mitchiner's *Science and Practice of Surgery*[4] is attested by its third appearance within the past 2 years. It is a work in two fairly large volumes. The subject matter is divided according to the usual plan into two divisions, that of general surgery and that of systemic surgery. It is a valuable contribution to the already somewhat long list of textbooks on surgery, and in its revised edition, embraces much of what is new in science and practice.

GEO. HALPERIN, M.D.

AFTER a historical review of our knowledge of pancreatic neoplasms, the authors of *Cancer du Pancréas*[5] express the view that the almost hopeless results of surgical intervention or interventions are due to a belated diagnosis. Therefore, improvement is to be sought in earlier diagnosis through the means of functional tests. There are chapters dealing extensively with the anatomy and physiology of the organ; with the question of frequency, etiology, and pathogenesis of pancreatic cancer. The chapter dealing with the histological study of pancreatic neoplasms is beautifully illustrated. There is an excellent discussion of various clinical forms, their symptoms and mode of evolution. Cancers of the head are separated from those of the tail, forms accompanied by simple glycosuria are separated from those accompanied by hyperinsulinism or by hypoglycæmia. Various functional tests are evaluated in the chapter on diagnosis.

Surgical treatment is the only one capable of holding out some hope. Total removal of the organ is contra-indicated on physiological grounds because it inevitably leads to a grave pancreatic diabetes. The technical difficulties are great and the immediate mortality is high. A rather exhaustive bibliography completes this excellent monograph.

GEO. HALPERIN, M.D.

[1] THE DIAGNOSIS AND TREATMENT OF BRAIN TUMORS. By Ernest Sachs, A.B., M.D. St. Louis: The C. V. Mosby Company, 1931.

[2] NOGUCHI. By Gustav Eckstein. New York and London: Harper and Brothers, 1931.

[3] SURGERY: ITS PRINCIPLES AND PRACTICE, FOR STUDENTS AND PRACTITIONERS. By Astley Paston Cooper Ashhurst, A.B., M.D., F.A.C.S. 4th ed. Philadelphia: Lea and Febiger, 1931.

[4] SCIENCE AND PRACTICE OF SURGERY. By W. H. C. Romanis, M.A. M.B., M.Ch.(Cantab.), F.R.C.S.(Eng.), F.R.S.(Edin.), and Philip H. Mitchiner, M.D., M.S.(Lond.), F.R.C.S.(Eng.). 3d ed. Vols. i and ii New York: William Wood and Company. 1930.

[5] CANCER DU PANCRÉAS. By Ch. Oberling and M. Guérin. Paris: Gaston Doin, 1931.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

MODERN PROCTOLOGY. By Marion C. Pruitt, M.D., L.R.C.P.S. (Ed.), F.R.C.S. (Ed.), F.A.C.S. St. Louis: The C. V. Mosby Company, 1931.

THE CAUSATION OF CHRONIC GASTRO-DUODENAL ULCERS; A NEW THEORY. By J. Jacques Spira, M.R.C.S. (Eng.), L.R.C.P. (Lond.). With an Introduction by Sir Humphry Rolleston, Bart., G.C.V.O., K.C.B. New York and London: Oxford University Press, 1931.

ENCEPHALITIS LETHARGICA, ITS SEQUELÆ AND TREATMENT. By Constantin von Economo. Translated by K. O. Newman, M.D. London: Oxford University Press, 1931.

DISEASES OF THE GUMS AND ORAL MUCOUS MEMBRANE. Sir Kenneth Goadby, K.B.E., M.R.C.S., L.R.C.P., D.P.H. (Cantab.), 4th ed. New York and London: Oxford University Press, 1931.

FRACTURES OF THE JAWS. By Robert H. Ivy, M.D., D.D.S., F.A.C.S., and Lawrence Curtis, A.B., M.D., D.D.S. Philadelphia: Lea & Febiger, 1931.

GYNÈCOLOGIE CHIRURGICALE. By C. Sobre-Casas. Paris: G. Doin et Cie, 1931.

WHAT THE PUBLIC SHOULD KNOW ABOUT CHILDBIRTH. By Walker Bourne Gossett, M.D. Minneapolis: The Midwest Company, 1931.

ANNUAL CLINICAL REPORT OF THE GOVERNMENT HOSPITAL FOR WOMEN AND CHILDREN, EGMORE, MADRAS, FOR THE YEAR 1929. Madras: The Superintendent, Government Press, 1931.

LE TRAITEMENT CHIRURGICAL DES OMOPLATES BALLANTES. By Dr. William J. Brunat. Lyon: Imprimerie M. Audin et Cie, 1931.

THE DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES IN GENERAL PRACTICE; THE ROUTINE MANAGEMENT OF SYPHILIS AND GONORRHŒA EMPLOYED IN THE ST. THOMAS'S HOSPITAL VENEREAL DISEASES DEPARTMENT. By L. W. Harrison, D.S.O., M.B., Ch.B., F.R.C.P.E. With a Chapter on The Medico-Legal Aspects, etc. By F. G. Crookshank, M.D., F.R.C.P., etc. 4th ed. New York and London: Oxford University Press, 1931.

CORRESPONDENCE

IS CANCER OF THE BREAST FOUND MORE OFTEN IN MARRIED WOMEN THAN IN UNMARRIED WOMEN?

To the Editor: That cancer of the breast is found more often in married than in unmarried women seems to be the general opinion and is so expressed in an article in the May, 1931, issue of this journal by Dr. John G. Stubenbord in "An Analysis of One Hundred and Fifty-eight Cases of Cancer of the Breast," from the First Surgical Division of New York Hospital, Service of Dr. Charles L. Gibson, to whom the profession owes so much for his teachings, especially in the development of the follow-up system of surgical procedures.

For a number of years I have been gaining the impression that cancer of the breast was really more common proportionally in single than in married women of the cancer age, yet I had no accurate records to support my impression. However, from a statistical study of cancer of the breast in Pennsylvania, by Dr. H. B. Wood, published in the *Medical Journal and Record*, December 5, 1928, we have valuable data.

In the State of Pennsylvania in 1920 there were 173,296 single women over 35 years of age; 907,710 married women over 35 years of age. In 1927 there were 1,666,470 females over 35 years of age.

Most carefully compiled vital statistics of the State of Pennsylvania for 1927, show that there were 810 deaths from cancer of the breast in women, 6 in men. There were 130 deaths from cancer of the breast in single women over 35 years of age, giving a death rate of 109 per 100,000; there were 678 deaths from cancer of the breast among married women, with a death rate of 44 per 100,000. Cancer of the breast in single women was, therefore, nearly three times more prevalent in Pennsylvania than among married women.

It is estimated that approximately 7 percent of the women of Pennsylvania over 35 years of age during 1927 were single and had the above given cancer death rates. As the deaths from cancer of the breast in this series of cases were two and one-half times more prevalent proportionally, among the women who were single than among those who had been married, it is evident that lactation has no influence on the production of cancer.

In a paper of my own, "Prognosis on Cancer of the Breast," in the *Nebraska State Medical Journal*, July, 1929, I called attention to Dr. Wood's Pennsylvania statistical report. My own opinion is that the natural functioning breast of the married woman is less liable to cancer than is that of the unmarried woman, because as the breast of the latter never has functioned as nature intended, senile changes develop more positively, and these are fertile fields for cancer growths, whatever may be the exciting causes.

It is to be presumed that the proportional number of single to married women in Pennsylvania is on the whole a fairly accurate condition in the majority of our population, and may be taken as a more than possible guide in arriving at an answer to the question of the title of this communication.

Omaha, Nebraska J. E. SUMMERS, M. D.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

C. JEFF MILLER, NEW ORLEANS, *President* ALLEN B. KANAVEL, CHICAGO, *President-Elect*
FRANKLIN H. MARTIN, *Director-General*

CHARLES GORDON HEYD, *Chairman, New York Committee*
JOHN E. JENNINGS, *Chairman, Brooklyn Committee*

COMPLETE PROGRAM FOR THE 1931 CLINICAL CONGRESS

CLINICAL CONGRESS PROGRAM IN BRIEF

All sessions at Waldorf-Astoria except as noted.

Monday, October 12

9:30. Hospital conference.
2:00. Clinics in the hospitals.
2:00. Hospital conference.
2:00. Surgical film exhibition.
8:15. Presidential meeting.

Tuesday, October 13

9:00. Clinics in the hospitals.
9:30. Hospital conference.
9:30. Surgical film exhibition.
2:00. Clinics in the hospitals.
2:00. Hospital conference.
2:00. Surgical film exhibition.
8:00. Hospital conference.
8:15. Scientific session, general surgery.
8:15. Section on otolaryngology—Academy of Medicine.

Wednesday, October 14—Brooklyn-Long Island Day

9:00. Clinics in the hospitals.
9:30. Surgical film exhibition.
9:30. Hospital conference.
2:00. Clinics in the hospitals.
2:00. Surgical film exhibition.
2:00. Hospital conference.
2:00. Conference on Teaching in Surgery.
8:00. Public meeting in Brooklyn—Academy of Music.
8:15. Scientific session, general surgery.
8:15. Section on ophthalmology—Academy of Medicine.

Thursday, October 15

9:00. Clinics in the hospitals.
9:30. Conference on Cancer Clinics.
9:30. Surgical film exhibition.
9:30. Hospital conference—Brooklyn.
2:00. Clinics in the hospitals.
2:00. Hospital conference—Brooklyn.
2:00. Annual meeting of the College.
3:00. Symposium on Cancer.
8:15. Scientific session, general surgery.

Friday, October 16

9:00. Clinics in the hospitals.
9:30. Surgical film exhibition.
9:30. Conference on Traumatic Surgery.
12:00. Meeting of new Fellows.
2:00. Clinics in the hospitals.
2:00. Conference on Traumatic Surgery.
2:00. Surgical film exhibition.
8:15. Convocation.

THE surgeons of New York and Brooklyn have prepared for the twenty-first annual Clinical Congress of the American College of Surgeons, beginning Monday, October 12, and ending Friday, October 16, a comprehensive program of clinics and demonstrations in their hospitals and medical schools that will completely represent the clinical activities of that great medical center in all departments of surgery. The program as published in the following pages should be considered only as an outline of the clinical program for the five days' session. The real program of the Congress will be issued daily in the form of bulletins. These will be posted at headquarters at the Waldorf-Astoria each afternoon presenting in detail the schedules for all hospitals for the following day. Printed bulletins containing the same material and with complete programs for the scientific sessions, conferences, etc., will be distributed each morning.

It will be noted that the program provides for operative clinics and demonstrations in the hospitals beginning at 2 o'clock on Monday afternoon and continuing during the following four days with clinics both morning and afternoon.

The Committee on Arrangements has provided for special fracture clinics in several of the hos-

pitals at which the methods employed and the results obtained in the treatment of fractures will be adequately demonstrated. Another important feature of the clinical program is to be found in the series of clinics at which the newer methods for the treatment of cancer by surgery, radium and X-ray will be demonstrated. Also, the program includes special clinics for the demonstration of methods employed in the rehabilitation of persons injured in industrial accidents, including the surgical treatment and physical therapy.

Wednesday has been designated as "Brooklyn-Long Island Day" and for that day special importance attaches to the program of clinics in the hospitals of Brooklyn and the Long Island suburbs. A program of clinics and demonstrations that includes many interesting features has been arranged by the Brooklyn and Long Island surgeons, as published in the following pages.

Special meetings of the sections on ophthalmology and otolaryngology of the New York Academy of Medicine have been arranged for Tuesday and Wednesday evening at the Academy through the courtesy of the officers of those sections in co-operation with sub-committees headed by Dr. Conrad Berens and Dr. Richard T. Atkins. Practitioners in these two specialties attending the Clinical Congress are invited to attend these special meetings for which programs have been prepared as presented in the following pages.

An exhibition of surgical films, both talking and silent, including some in colors, will be conducted at headquarters daily. Motion picture films that have been produced under the supervision of the Board on Medical Motion Pictures of the College will be exhibited, together with a number of outstanding contributions not included in the College library of films.

At the annual meeting of the College on Thursday afternoon beginning at 2 o'clock, in the ballroom of the Waldorf-Astoria, formal reports on the activities of the College will be presented by the officers and the several standing committees. Election of officers for the ensuing year will follow. At the conclusion of the annual meeting there will be a symposium on cancer at which the scientific aspects of the problem will be presented.

EVENING MEETINGS

In the following pages will be found the complete programs for the five general evening sessions as arranged by the Executive Committee, which meetings will be held in the ballroom of the Waldorf-Astoria Hotel. On Monday evening at the Presidential Meeting, following the introduction of distinguished guests from abroad, the retiring president, Dr. C. Jeff Miller, of New Orleans, will give a brief address and introduce the president-elect, Dr. Allen B. Kanavel, of Chicago. The John B. Murphy oration in surgery will be delivered by Mr. Arthur H. Burgess, of Manchester, England, professor of clinical surgery in Victoria University, and past president of the British Medical Association.

The fellowship address at the annual convocation on Friday evening will be given by Dr. James R. Angell, president of Yale University. At that session the 1931 class of candidates for Fellowship in the College will be received.

Dr. William Darrach, professor of clinical surgery in Columbia University, will present the annual oration on fractures at the session on Wednesday evening.

Among the distinguished visitors from abroad who will attend this year's Congress in addition to those whose names appear on the program of evening meetings are: Professor Hans von Haberer, of Cologne, Germany; Dr. José Goyanes, director of the National Institute for the Study of Cancer, Madrid, Spain, and chief of National League against Cancer; and Sir G. Lenthal Cheatle, surgeon to King's College Hospital, London.

COMMUNITY HEALTH MEETING

As a part of the program for "Brooklyn-Long Island Day" on Wednesday, the Executive Committee of the Congress has arranged for a public meeting in the Brooklyn Academy of Music at 8 P.M., at which addresses on subjects of popular interest will be presented by a number of outstanding men. The program will be found in the following pages. Dr. John E. Jennings, Chairman of the Brooklyn Committee on Arrangements, will preside.

CANCER CONFERENCE AND SYMPOSIUM

Under the auspices of the Committee on the Treatment of Malignant Diseases, a round table conference will be held in the ballroom of the Waldorf-Astoria on Thursday morning with Dr. Burton J. Lee, of New York, presiding. Papers and discussions presented at this conference will deal with the organization and administration of cancer clinics in general hospitals, cancer hospitals and institutes.

In the afternoon following the annual meeting of the College a symposium on cancer under the auspices of the same committee will be presented. Programs for these two sessions are as follows:

Morning Session, 9:30

Administration of a Cancer Clinic in a General Hospital.
CHARLES A. DUKES, M.D., Oakland, Calif.

Reference of Hospital Patients to the Cancer Clinic. CHANNING C. SIMMONS, M.D., Boston.
Rôle of the Social Service Worker in the Cancer Clinic of a General Hospital. MISS ELEANOR KELLY, Boston.
Character of Conferences of the Cancer Clinic Staff. EDWARD J. KLOPP, M.D., Philadelphia.
Importance of Nomenclature in Cancer Clinics. WILLIAM C. MCCARTY, M.D., Rochester, Minn.
Radium Containers and the Custody of Radium. EDWIN C. ERNST, M.D., St. Louis.
Uniformity of Cancer Records. LOUIS I. DUBLIN, Ph.D., New York.
Value of Diagnostic Cancer Clinics. BURTON J. LEE, M.D., New York.

Afternoon Session, 3:30

Report of the Committee on the Treatment of Malignant Diseases. ROBERT B. GREENOUGH, M.D., Boston.
The Rôle of Education in the Cancer Campaign. CLARENCE C. LITTLE, Sc.D., New York.
Plans for the Radiological Work at the California Institute of Technology. SEELEY O. MUDD, M.D., and CHARLES C. LAURITSON, Ph.D., Pasadena, Calif.
Newer Developments in X-Ray Therapy of Cancer. RALPH E. HERENDEEN, M.D., New York.
The Value of Radiation in the Treatment of Breast Carcinoma. SIR G. LENTHAL CHEATLE, K.C.B., C.V.O., F.R.C.S., London.
Treatment of Carcinoma of the Colon. SIR CHARLES GORDON-WATSON, K.B.E., C.M.G., London.
Surgery in Cancer. DONALD C. BALFOUR, M.D., Rochester, Minn.

CONFERENCE ON INDUSTRIAL MEDICINE AND TRAUMATIC SURGERY

An all-day conference under the auspices of the Board on Industrial Medicine and Traumatic Surgery with Dr. Frederic A. Besley, Chairman of the Board, presiding, will be held in the ballroom of the Waldorf-Astoria on Friday, at which the following program will be presented:

Morning Session, 9:30

Summary of the Year's Activities. FRANKLIN H. MARTIN, M.D., Director-General, Chicago.
Traumatic Surgery Clinic for Small Industries. HART E. FISHER, M.D., Chicago.
Ethylene as an Anæsthetic in Traumatic Surgery. DONALD GUTHRIE, M.D., Sayre, Pa.
Importance of the Follow-Up Clinic. GROVER C. PENBERTHY, M.D., Detroit.
Operative Treatment of Unilateral Fractures of the Femoral Condyles and Tibial Tuberosities. WILLIAM R. CUBBINS, M.D., Chicago.
Some Methods of Reducing Industrial Accident Severity. J. J. WITTMER, M.D., New York.
Spondylolisthesis. HENRY W. MEYERDING, M.D., Rochester, Minn.
Local Anæsthesia as a Factor in Reducing the Morbidity of Traumatic Surgery. LIEUTENANT-COMMANDER MORTON WILLCUTTS, M.C., U.S.N., Great Lakes, Ill.
The Advisability of the Early Return to Work of the Injured. WILLIAM L. ESTES, JR., M.D., and L. A. SHOUDY, M.D., Bethlehem, Pa.
The Prevention of Shock and Trauma During the Transportation of Surgical Cases by Fixed Traction Splinting. COLONEL WILLIAM L. KELLER, M.C., U.S.A., Washington.

Afternoon Session, 2:00

Convalescent Home as Applied to Medical Work in Industry. CASSIUS WATSON, M.D., New York.
The Industrial Accident Case—A Plea for Expert Industrial Surgery with Better Recognition by Heads of Industry and the Medical Profession. WILLIAM R. MCCLURE, M.D., Detroit.
Economic Readjustment Following Head Injuries. TEMPLE FAY, M.D., Philadelphia.
Labor's Interest in Industrial Medicine and Traumatic Surgery. EDWARD F. MCGRADY, Representative, American Federation of Labor, Washington.
Attitude of Medical and Surgical Section of the American Railway Association toward the Program of the American College of Surgeons. DANIEL WILLARD, President, Baltimore & Ohio Railroad, Baltimore.
Our Recognition of the Importance of Organization for the Care of Men and Women in Large Industries. EDWIN F. CARTER, Vice-President, American Telephone and Telegraph Company, New York.
My Interest in the Care of Men and Women in Industry. ALFRED E. SMITH, New York.

CONFERENCE ON GRADUATE AND UNDERGRADUATE TEACHING IN SURGERY

Eminent teachers and clinicians of the United States and Canada will contribute to a symposium dealing with methods of graduate and undergraduate teaching of surgery, which will be presented on Wednesday afternoon at 2 o'clock at the Waldorf-Astoria. The program is as follows:

Teaching of Surgery: FRED C. ZAPFFE, M.D., Chicago; ELLIOTT C. CUTLER, M.D., Cleveland.
Discussion by WILLIAM J. MAYO, M.D., Rochester, Minn.
Medical Education: IRVING S. CUTTER, M.D., Chicago.
Graduate Teaching: JOHN S. RODMAN, M.D., Philadelphia; GEORGE J. HEUER, M.D., Cincinnati; LOUIS B. WILSON, M.D., Rochester, Minn.; GEORGE P. MULLER, M.D., Philadelphia.

HOSPITAL STANDARDIZATION CONFERENCE

An interesting program of papers, round table conferences, and practical demonstrations dealing with problems related to the hospital standardization program of the College has been prepared for the fourteenth annual hospital conference which opens at 9:30 on Monday morning in the grand ballroom of the Waldorf-Astoria. The program for the annual conference has been planned to interest surgeons, hospital trustees, executives, and nurses. The College extends an invitation to attend the conference to all persons interested in the hospital field.

Monday—9:30 A.M.–12:00 M.

Chairman's address. The Obligation of the Hospital to the Interne Staff. C. JEFF MILLER, M.D., New Orleans.
Social Ideas in Hospital Service. ALLEN B. KANAVEL, M.D., Chicago.
Present Program of the American College of Surgeons. FRANKLIN H. MARTIN, M.D., Chicago.
Findings from the 1931 Hospital Standardization Survey. MALCOLM T. MACEACHERN, M.D., Chicago.

Program of the American College of Surgeons for the Care of the Ill and Injured in Industry. FREDERIC A. BESLEY, M.D., Waukegan, Ill.
Organizing a Service for the Diagnosis and Treatment of Cancer in an Approved Hospital. BOWMAN C. CROWELL, M.D., Chicago.
Responsibility of the Fellows of the College in Promoting the Hospital Standardization Program. SOUTHGATE LEIGH, M.D., Norfolk, Va.
Unification of Aims in the Hospital. REV. ALPHONSE M. SCHWITALLA, S.J., Ph.D., St. Louis.
Our Challenge: How Shall We Meet It? PAUL H. FESLER, Minneapolis.
Discussion: GEORGE W. CRILE, M.D., Cleveland.

2:00 P.M.–*5:00* P.M.

Significance of the Seemingly Insignificant Matters in Hospital Management. DONALD GUTHRIE, M.D., Sayre, Pa.
Discussion: LEWIS A. SEXTON, M.D., Hartford, Conn.
Present Status of Hospital Costs and Charges—Report of a Nation-Wide Survey. JOHN A. MCNAMARA, Chicago.
Discussion: C. W. MUNGER, M.D., Valhalla, N. Y.
Importance of More Adequate Sterilization Processes in Hospitals. WALTER E. DANDY, M.D., Baltimore.
Discussion: WALTER E. LEE, M.D., Philadelphia.
The Staff Conference Assuring a Thorough Review of the Clinical Work (illustrated). ALTON W. OCHSNER, M.D., New Orleans.
Discussion: D. A. CRAIG, M.D., Torrington, Conn.
Important Factors in Assuring Efficient Nursing Care of the Patient. JANET F. KORNGOLD, R.N., New Orleans.
Discussion: GRACE E. ALLISON, R.N., Troy, N. Y.
A Plan for the Systematic Instruction and Supervision of Internes and Resident Staff. H. L. FOSS, M.D., Danville, Pa.
Discussion: T. DWIGHT SLOAN, M.D., New York.

Tuesday—9:30 A.M.–*12:00* M.

Open Forum. A. J. SWANSON, Toronto, presiding.
Administrative and Economic Problems Associated with the "Open" Hospital. FRANK J. WALTER, Denver.
Discussion: BORIS FINGERHOOD, Brooklyn.
The Present Economic Depression in Hospitals—Increasing the Utilization of Hospital Facilities—Maintaining the Balance Between Economy and Efficiency. C. J. CUMMINGS, Tacoma, Wash.
Discussion: ARNOLD H. KEGEL, M.D., Chicago.
Factors to be Considered in the Cost of Medical Care from the Standpoint of the Hospital. WILLIAM H. WALSH, M.D., Chicago.
Discussion: CLIFFORD C. ROBINSON, M.D., Indiana Harbor, Ind.
What Shall We Do about Automobile Accidents?—Report of a Nation-Wide Survey. MATTHEW O. FOLEY, Chicago.
Discussion: JOHN M. SMITH, Philadelphia.
Assuring Harmony, Efficiency, and Community Good-Will in Managing Your Hospital. ROBERT JOLLY, Houston.
Discussion: E. MURIEL MCKEE, R.N., Brantford, Ontario.

2:00 P.M.–*5:00* P.M.

Hospital Social Work—A Particularly American Product. RICHARD C. CABOT, M.D., Cambridge, Mass.
Discussion: BERT W. CALDWELL, M.D., Chicago.
General Organization and Scope of Social Work in Medical Institutions. M. ANTOINETTE CANNON, New York.
Discussion: HUGH AUCHINCLOSS, M.D., New York.
Medical Social Work in Industrial Medicine and Traumatic Surgery. LOUISE C. ODENCRANTZ, New York.
Discussion: JANET THORNTON, New York.
Social Service and Cancer Control. GEORGE H. BIGELOW, M.D., Boston.
Discussion. FRANK RECTOR, M.D., Evanston, Ill.
Round table conference and general discussion conducted by BURTON J. LEE, M.D., New York.

8:00 P.M.–*10:00* P.M.

Special Session for Trustees. HENRY J. FISHER, New York, presiding.
Our Responsibility as Trustees. F. L. BRAMAN, Torrington, Conn.
Discussion: WILLIAM C. GEER, Ithaca, New York.
Promoting a Better Understanding between the Superintendent, Board of Trustees, and Medical Staff. CHARLES F. NEERGAARD, New York.
Discussion: JOHN R. HOWARD, JR., New York.
By What Criteria Can the Trustees or Governing Body Judge the Efficiency of Their Institution? S. S. GOLDWATER, M.D., New York.
The Application of Business Principles in Hospital Administration. HOWARD S. CULLMAN, New York.
Discussion: JOSEPH J. BAKER, Brooklyn.
What Do Hospital Trustees Expect from Their Superintendent? J. ALLEN JACKSON, M.D., Danville, Pa.
Discussion: THOMAS S. MCLANE, New York.

Wednesday—9:30 A.M.–*12:00* M.

Joint Session with Association of Record Librarians of North America. JOSEPH C. DOANE, M.D., Philadelphia, presiding.
A Complete System of Departmental Daily Reports Essential in Efficient Hospital Administration. SIDNEY G. DAVIDSON, Grand Rapids, Mich.
Discussion: HOWARD E. BISHOP, Sayre, Pa.
How Can Scientific Clinical Records Be Assured (illustrated)? JAMES T. NIX, M.D., New Orleans.
Discussion: PHILIP H. KREUSCHER, M.D., Chicago.
A Check System for Current Clinical Records. DOROTHY GILMAN, Seattle, Wash.
Discussion: EVELYN M. VREDENBURG, New York.
A Plan for Efficient Follow-Up and Study of End Results. GEORGE GRAY WARD, M.D., New York.
Discussion: IRVIN ABELL, M.D., Louisville.
A Plan for Measuring Surgical Results in the Community Hospital. CARL E. BLACK, M.D., Jacksonville, Ill.
Discussion: THOMAS R. PONTON, M.D., Augusta, Ga.

2:00 P.M.–*5:00* P.M.

Round Table Conference—Medical, nursing, administrative, and economic problems. Conducted by R. C. BUERKI, M.D., Madison, Wis., and ROBERT JOLLY, Houston, Texas.

Brooklyn—Thursday—9:30 A.M.–*12:00* M.

Demonstration and round table conferences conducted by MALCOLM T. MACEACHERN, M.D., Chicago; and ROBERT JOLLY, Houston, Texas; assisted by superintendents and heads of departments of hospitals. Procedure in admitting and discharging patients; organization and management of the case record department; nursing administration and service; operating room management and procedure; organization and management of the interne service.

2:00 P.M.–*4:00* P.M.

Demonstration and round table conferences conducted by ROBERT JOLLY, Houston, Texas; and MALCOLM T.

MACEACHERN, M.D., Chicago; assisted by superintendents and heads of departments of hospitals. Organization and management of the dietary department and food service; business methods in hospitals; management of the obstetrical department; handling of hospital visitors; public relations.

HEADQUARTERS

General headquarters for the Clinical Congress will be established at the new Waldorf-Astoria Hotel, located on Park Avenue between 49th and 50th Streets. This magnificent new hotel, with more than 2,000 guest rooms, which will open October 1, affords unusual facilities for sessions of the Clinical Congress. The grand ballroom and other large rooms and foyers on the second floor of the hotel have been reserved for the exclusive use of the Congress, for scientific meetings, conferences, film exhibitions, registration and ticket bureaus, bulletin boards, executive offices, scientific and technical exhibitions, etc. All the comforts and facilities of the old Waldorf-Astoria, which had been headquarters on the occasion of three previous Congresses, will be found in the new hotel with many added attractions and conveniences.

Space has been reserved in the Astor Gallery, Jade Room, and other large rooms and foyers on the second floor of the hotel adjacent to the grand ballroom for the Technical Exhibition, in which will be represented the leading manufacturers of surgical instruments, X-ray apparatus, operating lights, hospital apparatus of all kinds, pharmaceuticals, publishers of medical books, etc.

LIMITED ATTENDANCE—ADVANCE REGISTRATION

Attendance at the New York-Brooklyn session will be limited to a number that can be comfortably accommodated at the clinics, the limit of attendance being based upon the result of a survey of the amphitheaters, operating rooms, and laboratories in the hospitals and medical schools to determine their capacity for accommodating visitors. Under this plan it will be necessary for those who wish to attend to register in advance.

Attendance at all clinics and demonstrations will be controlled by means of special clinic tickets, which plan provides an efficient means for the distribution of the visiting surgeons among the several clinics and insures against overcrowding, as the number of tickets issued for any clinic will be limited to the capacity of the room in which that clinic will be given.

A registration fee of $5.00 is required of each surgeon attending the annual Clinical Congress, such fees providing the funds with which to meet the expenses of the meeting. To each surgeon registering in advance a formal receipt for the registration fee is issued, which receipt is to be exchanged for a general admission card upon his registration at headquarters. This card, which is non-transferable, must be presented in order to secure clinic tickets and admission to the evening meetings.

NEW YORK HOTELS AND THEIR RATES

There are many first-class hotels in the Grand Central Terminal district within easy walking distance of the Waldorf-Astoria, the headquarters hotel. The following hotels are recommended by the Committee on Arrangements.

	Minimum rates with bath	
	Single room	Double room
Ambassador, Park Ave. and 51st St.	$7.00	$10.00
Barclay, 111 East 48th St.	6.00	10.00
Biltmore, Madison Ave. and 43rd St	6.00	10.00
Chatham, Vanderbilt Ave. and 48th St.	5.00	8.00
Commodore, 42nd St. and Lexington Ave.	3.50	7.00
Gladstone, 114 East 52nd St.	4.00	6.00
Lexington, Lexington Ave. and 48th St.	3.50	6.00
Montclair, Lexington Ave. and 49th St.	3.00	5.00
New Weston, Madison Ave. and 50th St.	5.00	8.00
Park Lane, 299 Park Ave.	6.00	8.00
Ritz-Carlton, Madison Ave. and 46th St.	7.00	10.00
Roosevelt, Madison Ave. and 45th St.	5.00	7.00
Shelton, Lexington Ave. and 48th St.	3.00	4.00
Waldorf-Astoria, Park Ave. and 50th St.	7.00	10.00

REDUCED RAILWAY FARES

The railways of the United States and Canada have authorized reduced fares on account of the New York session of the Clinical Congress so that the total fare for the round trip will be one and one-half the ordinary first-class one-way fare. To take advantage of the reduced rates it is necessary to pay the full one-way fare to New York, procuring from the ticket agent when purchasing ticket, a "convention certificate," which certificate is to be deposited at headquarters for the signature of the general manager of the Clinical Congress and the visé of a special agent of the railways. Upon presentation of a viséd certificate to the ticket agent in New York not later than October 20 a ticket for the return journey by the same route as traveled to New York may be purchased at one-half the one-way fare.

In the eastern, central, and southern states and eastern provinces of Canada tickets may be purchased between October 8 and 14; in other sections of the United States and Canada at earlier dates. The return journey from New York must be begun not later than October 20 to be completed within thirty days from date of sale of going ticket.

The reduction in fares does not apply to Pullman fares nor to extra fares charged for passage on certain trains. Local railroad ticket agents will supply detailed information with regard to dates of sale, rates, routes, etc. Stop-overs on both the going and return journeys may be had within certain limits.

Full fare must be paid from starting point to New York, and it is essential that a "convention certificate" be obtained from the agent from whom the ticket is purchased. These certificates are to be signed by the general manager of the Clinical Congress and viséd by a special railroad agent at Clinical Congress headquarters in New York on or before October 16. No reduction in railroad fares can be secured except in compliance with the regulations outlined and within the dates specified. It is important to note that the return trip must be made by the same route as that used to New York and that the certificate must be deposited at headquarters during the meeting and return ticket purchased and used not later than October 20.

An exception to the above arrangement is to be noted in the case of persons traveling from points in certain far western states and British Columbia, who will be able to purchase round trip summer excursion tickets which will be on sale up to and including October 15 with a final return limit of October 31. The summer excursion fare is somewhat lower than the convention fare mentioned above, but the former is available only in certain of the far western states and British Columbia. Tickets sold at summer excursion rates permit traveling to New York by way of a direct route and returning by way of another direct route with liberal stop-over privileges.

BROOKLYN COMMUNITY HEALTH MEETING

ACADEMY OF MUSIC—WEDNESDAY, 8:00 P.M.

JOHN E. JENNINGS, M.D., Brooklyn, Presiding.

The American College of Surgeons. FRANKLIN H. MARTIN, M.D., Director-General, Chicago.
Marvels of Modern Medicine. ALLEN B. KANAVEL, M.D., Chicago.
Choosing Your Hospital. MALCOLM T. MACEACHERN, M.D., Chicago.
What You Should Know about Cancer. JOSEPH C. BLOODGOOD, M.D., Baltimore.
Preservation of Health in Industry. FREDERIC A. BESLEY, M.D., Waukegan, Ill.
Medicine in the Future. GEORGE W. CRILE, M.D., Cleveland.
Your Personal Responsibility for Health. C. JEFF MILLER, M.D., New Orleans.
Adding Years to Your Life. CHARLES H. MAYO, M.D., Rochester, Minn.
The Rôle of the Hospital in Human Salvage. ROBERT JOLLY, Houston, Texas.

PROGRAMS FOR EVENING MEETINGS

GRAND BALLROOM WALDORF-ASTORIA

Presidential Meeting—Monday, 8:15 P.M.

Addresses of Welcome: CHARLES GORDON HEYD, M.D., Chairman, New York Committee on Arrangements; and JOHN E. JENNINGS, M.D., Chairman, Brooklyn Committee on Arrangements.

Introduction of Foreign Guests.

Address of Retiring President: Medical Men and Their Lay Critics. C. JEFF MILLER, M.D., New Orleans.

Inaugural Address: Fundamentalism and Social Progress in Medicine. ALLEN B. KANAVEL, M.D., Chicago.

The John B. Murphy Oration in Surgery: Murphy, and Some Principles of Urinary Surgery. ARTHUR H. BURGESS, M.B., F.R.C.S., Manchester, England.

Tuesday, 8:15 P.M.

The Present Status of Cardiac Surgery. ELLIOTT C. CUTLER, M.D., Cleveland.

The Operative Approach to the Heart and Pericardium. ARTHUR M. SHIPLEY, M.D., Baltimore.

Technique and End-Results in Denervation of the Adrenal Glands. GEORGE W. CRILE, M.D., Cleveland.

Wednesday, 8:15 P.M.

The Newer Concept of Chronic Arthritis. RALPH PEMBERTON, M.D., Philadelphia.

A New Method of Operating for the Repair of Ruptured Cruciate Ligaments of the Knee Joint. WILLIAM R. CUBBINS, M.D., Chicago.

Fracture Oration: Some Old Truths about Fractures. WILLIAM DARRACH, M.D., New York.

Thursday, 8:15 P.M.

Peritoneal Adhesions: Their Prevention by the Use of Digestive Ferments. ALTON OCHSNER, M.D., and EARL GARSIDE, M.D., New Orleans.

Further Experiences with Fascial Repair of Hernia. W. EDWARD GALLIE, M.D., Toronto.

Curability of Cancer of the Stomach. DONALD C. BALFOUR, M.D., Rochester, Minn.

Some Experiences in the Treatment of Carcinoma of the Rectum with Radium. SIR CHARLES GORDON-WATSON, K.B.E., C.M.G., F.R.C.S., London, England.

Convocation—Friday, 8:15 P.M.

Invocation.

Conferring of Honorary Fellowships.

Presentation of Candidates for Fellowship, Class of 1931.

Presidential Address: The Program of the College and the Initiates' Responsibility. ALLEN B. KANAVEL, M.D., Chicago.

Fellowship Address: Medicine and the Contemporary Social Order. JAMES R. ANGELL, Ph.D., Litt.D., LL.D., President, Yale University, New Haven, Conn.

SURGERY OF THE EYE, EAR, NOSE AND THROAT

NEW YORK ACADEMY OF MEDICINE

Tuesday, 8:15 P.M.

An Outline of the Activities of the Otological Research Laboratory of the Johns Hopkins University during the Past Five Years. S. J. CROWE, M.D., Baltimore.

Some Intimate Studies of Nasal Function; Their Bearing upon Diagnosis and Treatment. ARTHUR W. PROETZ, M.D., St. Louis.

Wednesday, 8:15 P.M.

Symposium on Injuries to the Eye and Orbit:

Clinical Aspects. EDWARD B. HECKEL, M.D., Pittsburgh; GEORGE H. CROSS, M.D., Chester, Pa.; E. S. SHERMAN, M.D., Newark; and H. S. MILES, M.D., Bridgeport, Conn.

Pathological Aspects. BERNARD SAMUELS, M.D., New York.

Compensation in Eye Injury Cases. V. A. ZIMMER, Director of Workmen's Compensation, New York.

Prevention of Injury to the Eye. LOUIS H. CARRIS, Managing Director of the National Society for the Prevention of Blindness, New York.

PRELIMINARY CLINICAL PROGRAM

GENERAL SURGERY, GYNECOLOGY, OBSTETRICS, ORTHOPEDICS, UROLOGY, PROCTOLOGY, SURGICAL PATHOLOGY, ETC.

CLINICS IN NEW YORK HOSPITALS

MEMORIAL HOSPITAL

Monday

H. E. MARTIN and MR. ELLIS—2. Practical demonstration of aspiration biopsy of tumors.
B. S. BARRINGER—2:30. Implantation of radium for cancer of the bladder.
B. S. BARRINGER, A. L. DEAN, JR., and R. S. FERGUSON—3. End results in the treatment of cancer of the bladder, cancer of the prostate and teratoma of the testis, with exhibition of cases.

Tuesday

W. P. HEALY—9. Radium application for cancer of uterus.
W. P. HEALY and F. R. SMITH—9:30. End results in cancer of the uterus.
EDITH H. QUIMBY—11:30. Method of determination of the amount of radiation delivered to a specified tumor.
F. E. ADAIR and DR. PACK—2. Neurogenic sarcomas, melanomas.
R. E. HERENDEEN—3:30. Roentgen-ray treatment of giant cell tumors of bone.
F. W. STEWART—4. Exhibition of specimens of neurogenic sarcomas and melanomas.

Wednesday

DOUGLAS QUICK, H. E. MARTIN and DR. WATSON—9. Carcinoma of the mouth, pharynx and larynx, radium applications, operative procedures and end results.
JAMES EWING—2:30. The need for organized cancer clinics.
L. CRAVER—3. The treatment of lymphosarcoma, Hodgkin's disease and leukemia with exhibition of cases.

Thursday

B. J. LEE and F. E. ADAIR—9. Interstitial and external application of radium for carcinoma of the breast.
DR. HOFFMAN—9. Practical demonstration of Hoffman punch biopsy.
B. J. LEE and F. E. ADAIR—10. End results in carcinoma of the breast.
G. E. BINKLEY—2. Radiation therapy of cancer of the rectum; implantation of gold radon seeds.
W. B. COLEY and B. L. COLEY—3. Summary of methods of diagnosis and treatment of bone tumors; prognosis based on end results.
F. W. STEWART—4:30. Pathology of bone tumors.

Note.—Daily exhibition of roentgen ray department, radium element pack department, General Electric 900,000 volt X-ray machine and constant treatment unit.

BEEKMAN STREET HOSPITAL

Tuesday

ROBERT KENNEDY and H. HEYL—9. Fracture clinic.

Wednesday

RALPH COLP—9. Operative hernia clinic.

Thursday

W. WATTERS and W. SWIFT—9. Orthopedic operations.

Friday

SIGMUND MAGE and ROBERT FINDLAY—9. Fracture rounds.

FIFTH AVENUE HOSPITAL

Monday

BENJAMIN S. BARRINGER and staff—2. Urological operations and demonstration of cases.

Tuesday

FREDERIC W. BANCROFT—9. Duodenal ulcer operation.
CHARLES F. TENNEY—10. Medical treatment of duodenal ulcer.
FREDERIC W. BANCROFT—10. Surgical treatment of duodenal ulcer.
LEWIS G. COLE—10. Radiological diagnosis of duodenal ulcer.
FRANCES SHIELDS—10. Prenatal clinic.
LEON S. LOIZEAUX and staff—2. Demonstration of delivery room technique.

Wednesday

DONALD GORDON—9. Fracture clinic; treatment of fractures in a general hospital.
B. B. PALMER and M. W. CARR—2. Dental prophylaxis; treatment of fractured jaws.

Thursday

KINGSLEY ROBERTS—9. Abdominal operations; bacteriological studies of normal and infected peritoneal cavity.
FRANCES SHIELDS—10. Gynecological dry clinic; sterility.
WILLIAM L. SNEED—2. Orthopedic operations and demonstration of cases.
LEON S. LOIZEAUX and staff—2. Demonstration of delivery room technique.
FREDERIC W. BANCROFT—2. Dry clinic; Cancer of the large bowel, surgical treatment and follow-up.
ROBERT E. POUND—2. Radiological diagnosis of cancer of the large bowel.

Friday

FREDERIC W. BANCROFT and M. STANLEY-BROWN—9. General surgical operations; demonstration of postoperative thrombosis and embolism.

HOSPITAL FOR RUPTURED AND CRIPPLED

Tuesday

CARL G. BURDICK and staff—9. Hernia operations.
ARMITAGE WHITMAN and staff—2. Dry clinic: Adduction treatment of fractures of the neck of femur.

Wednesday

FENWICK BEEKMAN and staff—9. Hernia operations.
WILLIAM B. COLEY and BRADLEY L. COLEY—2. Dry clinic: Bone sarcomas.

Thursday

PERCY W. ROBERTS, WILLIAM L. SNEED and staff—9. Orthopedic clinic.
JOHN E. MCWHORTER—2. Pathological demonstration of bone tumors.

Friday

WILLIAM L. SNEED and staff—9. Orthopedic operations.

NEW YORK POST-GRADUATE HOSPITAL

Monday

FRED H. ALBEE—2. Orthopedic surgery.
GEORGE ANOPOL—4:30. Orthopedic clinic.

Tuesday

J. EASTMAN SHEEHAN—9. Treatment of keloidal scars; eyelid ectropions; facial burns; cancer disfigurements.
E. W. PETERSON—9. Pediatric surgery.
JOSEPH F. MCCARTHY, CLARENCE G. BANDLER, STANLEY R. WOODRUFF, JOSEPH A. HYAMS, J. SYDNEY RITTER, SAMUEL E. KRAMER, and C. TRAVERS STEPITA—9. Demonstration of the new radio arc method of prostate and prostatic bar excision; newer technical methods in the diagnosis and therapy of seminal vesicular conditions.
MORTIMER N. HYAMS—10. Demonstration of conization of the cervix.
WALTER T. DANNREUTHER—2. Gynecological operations.
THOMAS RUSSELL—2. Spinal anæsthesia.
JOHN F. ERDMANN—2:30. General surgical operations.
CHARLES OGILVY—4:30. Orthopedic surgery.

Wednesday

F. P. DE CAUX, M.R.C.S., L.R.C.P., London, England; DR. WIDENBORN, Freiburg, Germany; T. DRYSDALE BUCHANAN and CHARLES GORDON HEYD—9. Dry clinic: The barbiturates and basal narcotics; compression to the lung from various surgical positions; the spinal curve and ether anæsthesia in the lithotomy position; demonstration of the new Karl Connell apparatus; investigations to minimize the explosive risk of ethylene.
E. W. PETERSON—9. Pediatric surgery, dry clinic.
W. W. LASHER—11. Traumatic surgery.
CHARLES GORDON HEYD—2. Operations: Herniotomy, cholecystectomy, thyroidectomy, appendectomy.
Staff—4. Symposium: Liver and gall bladder. WARD J. MACNEAL: Liver changes in abdominal disease. JOHN A. KILLIAN: Biochemistry of liver and gall-bladder disease. CHARLES GORDON HEYD: Jaundice. LOUIS R. DAVIDSON: Postoperative therapy.
B. W. MOFFAT—4:30. Orthopedic surgery.

Thursday

FRED H. ALBEE—9. Orthopedic surgery.
Staff—9. Dry clinic: Diseases of the breast. WARD J. MACNEAL: Fibrocystic mastitis. HERBERT WILLY MEYER: Malignancies of the breast. CHARLES GORDON HEYD: Surgery of the breast. WILLIAM H. MEYER. X-ray therapy. B. A. GOODMAN: Glandular therapy in diseases of the breast. EDWARD V. DENNEEN: Preoperative and postoperative therapy.
J. W. HINTON—9. Goiter clinic.
JOSEPH F. MCCARTHY, CLARENCE G. BANDLER, STANLEY R. WOODRUFF, JOSEPH A. HYAMS, J. SYDNEY RITTER, SAMUEL E. KRAMER, and C. TRAVERS STEPITA—9. Demonstration, histopathology of prostate and vesicles; exhibition of corrosion specimen mountings of the latter; exhibition of methods of intravenous and retrograde urographic diagnosis.
JOHN J. MOORHEAD—2. Traumatic surgery.
GEORGE ANOPOL—4:30. Orthopedic surgery.

Friday

J. EASTMAN SHEEHAN—9. Nasal disfigurements, congenital or acquired, elements all present; nasal disfigurements involving loss of elements.
THOMAS H. CHERRY—9. Gynecological operations.
Staff—9. Symposium: Diseases of the thyroid. RALPH R. MOOLTEN: Classification of goiter. JAMES J. FLEMING: Iodine in goiter. D. PHILIP MACGUIRE: Pre-operative and postoperative therapy. CHARLES GORDON HEYD: Hyperthyroidism. WALDEN E. MUNS: The heart in hyperthyroidism. REYNOLD CHURCH and DR. MEEKER: Thyroiditis and Reidel's struma.
E. W. PETERSON—9. Pediatric surgery.
WALTER T. DANNREUTHER—10. Gynecology.
HENRY H. RITTER—11. Traumatic surgery.
WALTER T. DANNREUTHER—2. Gynecological operations.
E. C. BRENNER—2. Surgical clinic, lantern slides.
J. F. ERDMANN—2:30. General surgery.
CHARLES OGILVY—4:30. Orthopedic surgery.

BETH ISRAEL HOSPITAL

Monday

HARRY E. ISAACS—2. General surgical operations.
HERMAN SCHWARZ—2. Surgery in children.

Tuesday

J. J. HERTZ—10. Gastric surgery.
E. G. LANGROCK—11. Surgery in obstetrics.
I. C. RUBIN—2. Gynecological operations.
MARCUS ROTHSCHILD—2. Medical aspects of surgical cases.

Wednesday

I. C. RUBIN—10. Gynecological clinic.
A. HYMAN—11. Genito-urinary clinic.
A. HYMAN—2. Genito-urinary surgery.
LEO DAVIDOFF—2. Neurosurgical operations.
E. D. FRIEDMAN—2. Neurosurgical clinic.

Thursday

M. ROBINSON—10. Gynecological clinic.
LEO DAVIDOFF—11. Neurosurgical clinic.
DEWITT STETTEN—2. General surgical operations.
A. A. EPSTEIN—2. Medical aspects of surgical cases.

Friday

DEWITT STETTEN—10. Surgical clinic.
MEYER ROBINSON—2. Gynecological operations.
ALFRED PLAUT—2. Pathological conference.

KNICKERBOCKER HOSPITAL

Monday

PHILIP D. ALLEN—2. Blood transfusion, Tindermann method.

Tuesday

W. A. FRASER—9. Gynecological clinic.
H. J. SHELLEY—2. General surgery.

Wednesday

PAUL C. MORTON—9. General surgery.

JEWISH MATERNITY HOSPITAL

Tuesday

N. RATNOFF and staff—10. Obstetrical clinic.
N. RATNOFF and staff—2. Obstetrical operations.

Wednesday

S. J. SCADRON and staff—10. Obstetrical clinic.
S. J. SCADRON and staff—2. Obstetrical operations.

Thursday

E. G. LANGROCK and staff—10. Obstetrical clinic.
E. G. LANGROCK and staff—2. Obstetrical operations.

BROAD STREET HOSPITAL

Monday

CHARLES GOODMAN—2. Vascular surgery.
GUSTAV J. E. TIECK—4. Sinus operations.

Tuesday

BENJAMIN T. TILTON—10. General surgery.
WILLIAM A. KELLOGG—2. Gastro-intestinal surgery.
WILLIAM SHARPE—4. Neurological surgery.

Wednesday

A. J. WALSCHEID—10. Gynecology.
MAURICE MELTZER—2. Genito-urinary surgery.

Thursday

FRED S. DUNN—10. Oral surgery.
FRED H. ALBEE—2. Orthopedic surgery.

Friday

POL N. CORYLLOS—10. Thoracic surgery.
MAX BARUCH—2. General surgery.
T. F. X. SULLIVAN—4. General surgery.

CITY HOSPITAL

Monday

E. F. KILBANE—2. Genito-urinary surgery.
J. E. FULD—2. Orthopedic surgery.

Tuesday

L. W. CROSSMAN—2. General surgery.
E. M. COLIE—2. Gynecology.
G. E. BINKLEY—2. Rectal surgery.

Thursday

J. P. GRANT—2. General surgery.
J. B. CLARK—2. Genito-urinary surgery.

Friday

E. W. PINKHAM—2. Gynecology.
A. S. MORROW—2. General surgery.
J. R. LISA—2. Pathological conference.

MEDICAL CENTER

(Babies, Neurological, Presbyterian and Sloane Hospitals)

Monday

J. BENTLEY SQUIER—2. Urological operations.

Tuesday

BENJAMIN P. WATSON—9. Gynecological clinic.

Wednesday

HUGH AUCHINCLOSS—9. Surgery of the breast.

Thursday

FORDYCE B. ST. JOHN—9. Surgery of the stomach and duodenum.

Friday

WILLIAM DARRACH—9. Fracture clinic.

DETENTION HOSPITAL

Tuesday

EDWARD C. BRENNER or HARRY V. SPAULDING—9. Gynecological operations.

Thursday

EDWARD C. BRENNER or JOSEPH FULD—9. Gynecological operations.

BELLEVUE HOSPITAL

Monday

WILLIAM T. DORAN and associates—2. Gall-bladder disease.
A. R. STEVENS and staff—2. Demonstration of urological cases.

Tuesday

RUSSELL H. PATTERSON—9. General surgery.
ARTHUR M. WRIGHT and staff—9. General surgery.
ARTHUR S. MCQUILLAN and EUGENE BECK—9. Diseases of the thyroid.
F. C. HOLDEN and staff—9. Gynecological clinic.
IRA KAPLAN and staff—9. Treatment of malignancies by radiation.
A. R. STEVENS and staff—2. Urological operations.

Wednesday

JOHN E. SUTTON—9. General surgery.
ARTHUR M. WRIGHT and staff—9. General surgery.
F. C. HOLDEN and staff—9. Gynecological clinic.
IRA KAPLAN and staff—9. Treatment of malignancies by radiation.
KENNETH M. LEWIS, I. E. SIRIS and LESTER BREIDENBACH—2. Fracture clinic.
A. R. STEVENS and staff—2. Urological clinic.

Thursday

Staff, second surgical division—9. General surgery, dry clinic.
JOHN H. MORRIS and JOHN V. BOHRER—9. Chest surgery.
KENNETH M. LEWIS—9. Varicose veins clinic.
GEORGE D. STEWART, ARTHUR M. WRIGHT and staff—11:30. General surgery, dry clinic.

Friday

CARL G. BURDICK—9. General surgery.
GEORGE D. STEWART, ARTHUR M. WRIGHT and staff—11. General surgery.
JAMES W. HINTON—2. Gastro-intestinal clinic.
A. R. STEVENS and staff—2. Urological operations.

ROOSEVELT HOSPITAL

Monday

JAMES I. RUSSELL—2. General surgery.
HENRY W. CAVE—2. General surgery.

Tuesday

ALFRED STILLMAN—9. General surgery.
HOWARD C. TAYLOR—9. Gynecology.
CONDICT CUTLER—10. General surgery.

Wednesday

KIRBY DWIGHT—9. General surgery.
THOMAS PEIGHTAL—9. Gynecology.
GRANT P. PENNOYER—10. General surgery.

Thursday

WILLIAM C. WHITE—9. General surgery.
HOWARD C. TAYLOR, JR.—9. Gynecology.
HOWARD A. PATTERSON—10. General surgery.

Friday

EDWARD F. KILBANE—9. Urology.

CANCER INSTITUTE

Tuesday

IRA I. KAPLAN—2. Cancer clinic.

WOMAN'S HOSPITAL

Monday

B. H. GOFF and R. HURD—2. Gynecological operations.
GRETE STOHR—2. Pathological demonstration.
FREDERICK J. MATTHEWS—3. Orthopedic clinic.
HARRIETT MCINTOSH—4. X-ray diagnosis and therapy in gynecology and obstetrics.

Tuesday

HERMAN GRAD and E. A. BULLARD—9. Gynecology.
H. G. BUGBEE and staff—9. Urological clinic.
HARRIETT MCINTOSH—12. X-ray diagnosis and therapy in gynecology and obstetrics.
GEORGE GRAY WARD, L. K. P. FARRAR and W. T. KENNEDY—2. Gynecological operations.
GRETE STOHR—2. Pathological demonstration.
W. H. GLAFKE—2:30. Gastro-enterological clinic, relating to gynecology.
E. C. LYON and assistants—2:30. Prenatal clinic.
H. E. PARDEE—2:30. Cases of pregnancy complicated by heart disease.

Wednesday

GEORGE GRAY WARD and L. K. P. FARRAR—10. Exhibition of cases of carcinoma of uterus that have been treated with radium.
E. C. LYON and assistants—11. Demonstration of obstetrical ward and delivery room technique.
HARRIETT MCINTOSH—11. X-ray diagnosis and therapy in gynecology and obstetrics.

Thursday

R. M. RAWLS and A. H. ALDRIDGE—9. Gynecological operations.
H. G. BUGBEE and assistants—9. Urological clinic.
HARRIETT MCINTOSH—12. X-ray diagnosis and therapy in gynecology and obstetrics.
B. H. GOFF and R. HURD—2. Gynecological operations.
GRETE STOHR—2. Pathological demonstration.
E. C. LYON and assistants—3. Postnatal clinic.
W. L. CARR, H. R. MIXSELL and J. F. LANDON—3. Pediatric clinic.

Friday

HERMAN GRAD and E. A. BULLARD—9. Gynecological operations.
E. C. LYON and assistants—9:30. Prenatal clinic; special clinic for abnormal cases and lecture on antepartum care to clinic patients.
J. N. NATHANSON—11. Luetic clinic.
HARRIETT MCINTOSH—12. X-ray diagnosis and therapy.
GEORGE GRAY WARD, L. K. P. FARRAR and W. T. KENNEDY—2. Gynecological operations.
W. H. GLAFKE—2. Gastro-enterological clinic.
GRETE STOHR—2. Pathological demonstration.
E. C. LYON and assistants—3. Demonstration of obstetrical ward and delivery room technique.

Note.—Daily demonstrations "standardized technique," by the nursing staff; "keeping of records" by record librarian. Inspection of new outpatient clinic on Tuesday, Wednesday, Thursday and Friday.

FRENCH HOSPITAL

Tuesday

P. R. TURNURE, L. M. ALOFSIN, M. I. BLANK, H. C. FALK and staff—9. General surgery.

Wednesday

L. G. COLE and P. R. TURNURE—9. Surgical and X-ray clinic.

NEW YORK ORTHOPÆDIC HOSPITAL

Monday

ALAN DEF. SMITH and staff—2. Out-patient clinic.

Tuesday

RUSSELL A. HIBBS and staff—9. Ward rounds and post-operative clinic.
RUSSELL A. HIBBS, BENJAMIN P. FARRELL, HALFORD HALLOCK and staff—2. Out-patient clinic.

Wednesday

RUSSELL A. HIBBS, BENJAMIN P. FARRELL and staff—9. Orthopedic operations.
ALAN DEF. SMITH and staff—2. Out-patient clinic.

Thursday

RUSSELL A. HIBBS and staff—9. End-results of spine, hip, knee, ankle and shoulder fusion for tuberculosis.
BENJAMIN P. FARRELL, HALFORD HALLOCK and staff—2. Out-patient clinic.

Friday

RUSSELL A. HIBBS, BENJAMIN P. FARRELL, ALAN DEF. SMITH, HALFORD HALLOCK and JOSEPH C. RISSER—9. Spine fusion for tuberculosis and scoliosis; hip and knee fusion for tuberculosis; open reduction of congenital dislocation of hip.
RUSSELL A. HIBBS, BENJAMIN P. FARRELL, ALAN DEF. SMITH and staff—2. Out-patient clinic.

Daily

DRS. HALBACH, HOWORTH and SAUNDERS. Exhibit of anatomical and pathological specimens.
A. B. FERGUSON. Photographs and X-rays illustrating special X-ray technique.

RECONSTRUCTION HOSPITAL

Monday

E. A. DOOLEY—2. Fractures of the forearm.
D. GOLDBLATT—3. Fractures of the femur.
H. M. BERGAMINI—4. Fracture return clinic.

Tuesday

J. J. MOORHEAD—9. Traumatic surgery, ward rounds.
H. H. RITTER and staff—2. Traumatic surgery, operative.
H. M. BERGAMINI—2. Traumatic surgery, operative.
W. D. LUDLUM, JR.—2. Traumatic surgery, dry clinic.

Wednesday

W. W. LASHER—9. Injuries of the knee.
C. A. PETERSON—10:30. Head and spine injuries.

Friday

K. G. HANSSON and HAROLD M. HERRING—9. Physical therapy.

STUYVESANT SQUARE HOSPITAL

Tuesday

ALBERT S. MORROW—9. Cancer clinic, operative.

Wednesday

ROBERT H. KENNEDY—9. Cancer clinic, operative.

Thursday

ALBERT S. MORROW—9. Follow-up clinic on results in cancer patients.

Friday

ROBERT H. KENNEDY—9. Follow-up clinic on results in cancer patients.

NEW YORK POLYCLINIC HOSPITAL

Monday

LOUIS J. LADIN—1:30. Gynecological operations.
FRANK C. YEOMANS—1:30. Operative proctology.
D. A. SINCLAIR—3. Urological operations.
J. PRESCOTT GRANT—3. General surgical operations.
F. C. KELLER—4:30. Dry clinic: Surgical anatomy.

Tuesday

MALCOLM CAMPBELL—9. Operative gynecology.
HAROLD D. MEEKER—11. General surgical operations.
JEROME M. LYNCH—1:30. Operative proctology.
ROSS MCPHERSON—3. Obstetrical clinic.
JOHN J. NUTT—4:30. Orthopedic operations.

Wednesday

GEORGE B. LEE—9. Gynecological operations.
A. E. SELLENINGS—11. General surgical operations.
EDWARD L. KELLOGG—1:30. Gastroenterology.
J. J. VALENTINE—3. Urological operations.
CHARLTON WALLACE and TOUFICK NICOLA—4:30. Orthopedics.

Thursday

D. W. TOVEY—9. Operative gynecology.
JOHN J. MCGRATH—11. General surgical operations.
HERBERT C. CHASE—1:30. General surgical operations.
EVERETT M. HAWKS—3. Obstetrics.
J. E. HAMMETT—4:30. Dry clinic: Surgery of tongue.

Friday

ROBERT L. MCCREADY—9. Operative gynecology.
ROBERT E. BRENNAN—11. General surgical operations.
W. V. HEALEY—1:30. Fracture clinic.
HERBERT B. REECE—3. Operative urology.

MOUNT SINAI HOSPITAL

Monday

ROBERT T. FRANK and staff—2. Plastic operations on the vagina.
RICHARD LEWISOHN—2. Blood studies in jaundice cases.

Tuesday

A. A. BERG and staff—9. Gastro-intestinal surgery.
EDWIN BEER and staff—2. Genito-urinary surgery.
HAROLD NEUHOF—2. Demonstration of thoracic cases.
W. HARRIS—2. Radiotherapy of surgical diseases.

Wednesday

PHILIP W. NATHAN and staff—9. Orthopedic surgery.
GEORGE BAEHR and PAUL KLEMPERER—3:30. Pathological demonstration.

Thursday

RICHARD LEWISOHN and staff—2. Thyroid surgery.
ROBERT T. FRANK—2. Reconstruction of vagina; demonstration of female sex hormones, blood and urine tests.
LEOPOLD JACHES and staff—2. Roentgenological aspects of surgical diseases.

Friday

PHILIP W. NATHAN—9. Demonstration of orthopedic cases.
HAROLD NEUHOF and staff—2. Chest surgery.

ST. FRANCIS HOSPITAL

F. G. EDGERTON, T. H. RUSSELL, C. J. VEJVODA and E. A. CAMPBELL—9, daily. General surgery and gynecology.

FLOWER HOSPITAL

Monday

CLAUDE BURRETT—2. Goiter problems.
EARL EATON—2. Hernia clinic.

Tuesday

HORACE AYERS—9. Tumors of the pelvis.
HENRY SAFFORD—9. Elective cæsarean.
SPRAGUE CARLETON—2. Prostatic problems.
WALTER HALFMAN—2. Kidney tumors.
RAPHAEL LEWY—2. Industrial surgery.

Wednesday

LOUIS KAUFMAN—9. Hydronephritis.
SAMUEL LUBASH—9. Kidney function tests.
ANSON H. BINGHAM—2. Orthopedic surgery.
MILTON WILSON—2. Compound fractures.

Thursday

WILLIAM F. HONAN—2. Thoracic surgery.

Friday

JOSEPH H. FOBES—9. General surgery.
WILLIAM A. FRASER—9. General surgery.
WILLIAM P. ECKES—9. General surgery.
GEORGE W. LUTTON—2. Traumatic infections of the hand.
E. WELLES KELLOGG—2. Obscure infections of wounds.
Note.—Demonstrations in newer methods of anæsthesia by Donald Brace, James Gales, and George Van Gilluwe.

ST. VINCENT'S HOSPITAL

Tuesday

EDWARD L. KEYES and staff—9. Urological clinic.
GEORGE R. STUART—9. General surgery.
FRANK N. DEALY—9. General surgery.
WILLIAM G. DORAN—9. Fractures.

Wednesday

RAYMOND P. SULLIVAN—9. Surgical clinic.
WILLIAM M. FORD, W. KRUGLER, J. MCGRATH, J. HENNESSY and A. RAGGI—9. Gynecological clinic.
WILLIAM G. DORAN—2. Orthopedic clinic, congenital dislocation of hip.

Thursday

GEORGE DAVID STEWART—9. General surgical operations.
ARTHUR M. WRIGHT—9. General surgical operations.
EDWARD A. KING—9. General surgical operations.
LOUIS F. SANMAN—2. Transfusion.

Friday

WILLIAM M. FORD, W. KRUGLER, J. MCGRATH, J. HENNESSY and A. RAGGI—9. Gynecological clinic.
CONSTANTINE J. MACGUIRE—9. Surgical demonstration of cases.

NEW YORK HOSPITAL

Tuesday

JAMES MORLEY HITZROT and staff—9. General surgery.
O. S. LOWSLEY—2. Urology.

Wednesday

EUGENE H. POOL and staff—9. General surgery.
O. S. LOWSLEY—2. Clinical demonstration.

Thursday

JAMES MORLEY HITZROT and staff—9. General surgery.

Friday

EUGENE H. POOL and staff—9. General surgery.

HARLEM HOSPITAL

Monday

Staff—2. Conference on pathology and surgery.

Tuesday

H. C. Falk and staff—9. Gynecology.
Sidney Adler—2. Rectal diseases.

Wednesday

John F. Connors, J. Wishner, L. Wright and J. Stenbuck—9. Traumatic surgery.

Thursday

H. B. Eisberg and C. Casassa—9. General surgical clinic.
A. M. Sala and B. N. Berg—2. Surgical pathology.

Friday

H. C. Falk—9. Diagnostic gynecology.
F. Kassebohm—2. Obstetrical clinic.

MISERICORDIA HOSPITAL

Monday

F. W. Sovak—2. Gynecology.

Tuesday

Anthony H. Harrigan—9. General surgery.

Wednesday

Robert E. Brennan—9. General surgery.
Jacob Heckmann—2. General surgery.

Thursday

Edward F. Kilbane—9. Genito-urinary surgery.
Alexander H. Schmitt—2. Obstetrics.

Friday

Francis E. Butler—9. Orthopedics.
Gaston A. Carlucci—2. General surgery.

LEBANON HOSPITAL

Tuesday

Harry Aranow, A. J. Rongy and Edward Schnaper—9. Gynecology.

Wednesday

Milton R. Bookman, Philip M. Grausman, L. Miller Kahn and Henry Roth—9. General surgery.

Thursday

Harry Aranow, A. J. Rongy and Edward Schnaper—9. Gynecology.

Friday

Milton R. Bookman, Philip M. Grausman, L. Miller Kahn and Henry Roth—9. General surgery.

MONTEFIORE HOSPITAL

Monday

Julius Gottesman, Maurice Lenz and J. M. Ziegler—2. Cancer clinic.

Tuesday

P. W. Nathan—9:30. Orthopedic surgery.

Wednesday

Harold Neuhof—2:30. Thoracic surgery.

Thursday

Ira Cohen—2. Neurosurgical operations.

HOSPITAL FOR JOINT DISEASES

Tuesday

P. M. Grausman—9. General surgery.
Harry Goldman—10. Proctological surgery.
H. L. Jaffe—11:30. Pathology.
A. J. Beller—2. General surgery.
Milton Bodenheimer—2. General surgery.

Wednesday

H. L. Frauenthal, Leo Mayer and M. M. Pomeranz—9. Orthopedic clinic, operations and demonstration of cases; roentgenological demonstration of bone lesions.

Thursday

Paul W. Aschner—9. Urological surgery.
Arthur Stein—10. Gynecological surgery.
M. M. Pomeranz—11. Pyelography.

Friday

H. Finkelstein—9. Orthopedic operations.
Samuel Kleinberg—10:30. Demonstration of orthopedic patients.

LINCOLN HOSPITAL

Tuesday

Kirby Dwight and B. Sherwin—9. General surgical operations.
E. T. Hull—9. Gynecological operations.

Wednesday

E. D. Truesdell and C. S. Rogers—9. General surgical operations.
P. H. Williams—9. Gynecological operations.
G. Gottlieb—2. Roentgenology.

Thursday

G. Aufricht and J. Friedman—9. Plastic surgery.

Friday

E. J. Davin—9. Gynecological operations.
Kirby Dwight and staff—10. General surgery.

METROPOLITAN HOSPITAL

Monday

J. H. Fobes and staff—2. General surgery.

Tuesday

Sprague Carleton and staff—10. Genito-urinary surgery.
W. F. Honan and staff—2. Thoracic surgery.

Wednesday

H. B. Safford and staff—10. Gynecology.
R. F. Ward and staff—2. General surgery.

Thursday

W. A. Fraser and staff—2. General surgery.

Friday

A. H. Bingham and staff—10. Orthopedic surgery.
L. C. Salisbury and staff—2. General surgery.

ST. MARY'S HOSPITAL

Tuesday

C. E. Farr—9. Undescended testis in children.

Thursday

Edward D. Truesdell—9. Hare-lip and cleft palate.

Friday

Lucius A. Wing—9. Congenital deformities.

ST. LUKE'S HOSPITAL

Tuesday

WALTON MARTIN—9. General surgery.
JOHN DOUGLAS—9. General surgery.

Wednesday

H. H. M. LYLE—9. General surgery.
FRANK S. MATHEWS—9. General surgery.

Thursday

EDWARD J. DONOVAN—9. General surgery.
WILLIAM F. MACFEE and EDWARD D. TRUESDELL—9. General surgery.

Friday

MORRIS K. SMITH—9. General surgery.
HENRY G. BUGBEE—9. Genito-urinary surgery.
MATHER CLEVELAND—2. Orthopedic surgery.

FORDHAM HOSPITAL

Monday

A. G. FORMAN—2. General surgical operations.

Tuesday

L. MARTON—2. General surgical operations.

Wednesday

E. R. CUNNIFFE—2. General surgical operations.

Thursday

S. W. BOORSTEIN—9. Orthopedic operations.
ALEXANDER NICOLL—2. General surgical operations.

Friday

J. H. TELFAIR—9. Obstetrical operations.
R. EMMET WALSH—2. General surgical operations.

MORRISANIA HOSPITAL

Tuesday

J. LEWIS AMSTER—9. General surgical clinic.
JULIUS J. VALENTINE—2:30. Urological surgery.

Wednesday

EDWIN A. SPIES—9. Fractures.
J. LEWIS AMSTER—2:30. General surgical clinic.
S. F. WEITZNER—2:30. X-ray demonstration.

Thursday

E. R. CUNNIFFE—9. Thyroid surgery.
GEORGE MILANI—2:30. General surgery.

Friday

EDWIN A. SPIES—9. Operative skeletal surgery.

MIDTOWN HOSPITAL

Wednesday

J. SIDNEY RITTER—9:30. Urological clinic.

Thursday

LOUIS MARTON—9. General surgery.

Friday

MARTIN J. SYNNOTT—4. Proctological surgery.

LYING-IN HOSPITAL

JAMES A. HARRAR, C. F. JELLINGHAUS, L. A. WING, M. ROSENSOHN, W. H. HAWKINS, K. B. STEELE, F. R. SMITH, J. A. O'REGAN, N. B. SACKETT, J. T. SHERMAN, W. C. GODDARD and R. L. CRAIG—9, daily. Obstetrical clinics and laboratory demonstrations.

GOUVERNEUR HOSPITAL

Monday

THOMAS H. RUSSELL—2. General surgery.

Tuesday

WILLIAM V. HEALEY—9. Fracture clinic.
EDWARD L. KELLOGG—2. General surgery.

Wednesday

WILLIAM A. KELLOGG—9. General surgery.
WILLIAM H. W. KNIPE—10. Obstetrics.
PHILIP M. GRAUSMAN—2. General surgery.

Thursday

JOSEPH GIRSDANSKY—9. General surgery.
ALBERT E. SELLENINGS—2. General surgery.

LENOX HILL HOSPITAL

Tuesday

FRANK R. OASTLER and staff—9. Gynecological clinic.
FRANK R. OASTLER and staff—2. Gynecological clinic.

Wednesday

DEWITT STETTEN and staff—9. General surgical clinic.
CARL EGGERS and staff—2. General surgical clinic.

Thursday

HERMAN FISCHER and staff—9. General surgical clinic.
OTTO H. PICKHARDT and staff—2. General surgical clinic.

Friday

PERCY H. WILLIAMS and staff—9. Gynecological clinic.
PERCY H. WILLIAMS and staff—2. Gynecological clinic.

JERSEY CITY HOSPITAL

(Jersey City, N. J.)

Tuesday

CHARLES B. KELLEY—9. Gynecological clinic.
S. B. SPRAGUE—2. Fracture clinic.

Thursday

S. A. COSGROVE—10. Obstetrical clinic.
W. G. DORAN—2. Fracture clinic.

Friday

W. G. DORAN—9. Orthopedic clinic: Congenital dislocation of hip, motion picture demonstration.

BRONX HOSPITAL

Tuesday

A. O. WILENSKY—2. General surgery.

Wednesday

LEO BUERGER—9. General surgery.
SIDNEY COHN—9. General surgery.

Friday

SIDNEY COHN—9. General surgery.
A. O. WILENSKY—2. General surgery.

CORRECTION HOSPITAL

Tuesday

EDWARD C. BRENNER—2. General surgery.

Wednesday

GEZA GREENBERG—9. Genito-urinary surgery.

Thursday

EDWARD C. BRENNER or M. O. MAGID—2. Gynecological operations.

SPECIAL CLINICS FOR BROOKLYN-LONG ISLAND DAY—WEDNESDAY

LONG ISLAND COLLEGE HOSPITAL

Department of Urology

J. S. READ. Resection of infected renal calyx with stone.
A. HARRIS. Nupercain anæsthesia in urology.
F. L. SENGER. End results in ureterosigmoidostomy.
G. R. HORTON. The prostate and vesicles as foci in arthritis.
W. B. TATUM. Stricture of the female urethra.
P. C. FLERI. Idiopathic scrotal gangrene.
E. K. MORGAN. Five years experience with vas resection.
F. C. FARROW. Resection of urethral diverticulum.

Department of Obstetrics and Gynecology

A. C. BECK. End results in eclampsia.
W. A. JEWETT. Complications of fibroids.
GORDON GIBSON. Prolapse of the uterus.
H. B. MATTHEWS. Ectopic gestation in women over thirty-five years of age.
S. A. WOLFE. Sarcoma of the uterus.
G. W. PHELAN. Seminoma of the ovary.
B. A. HARRIS. Complications of ovarian tumors.
T. S. WELTON. Congenital atresia of the vulva.
M. GLASS. Intraligamentous pregnancy.
A. S. MACGREGOR. Embryonal carcinoma of the ovary in a fifteen-year old girl.
V. P. MAZZOLA. Postabortal sepsis.
S. KAMINESTER. Aschheim-Zondek and similar tests.
M. V. ARMSTRONG. Management of occipitoposteriors.

Department of Surgery

E. GOETSCH. Preparation of patients with hyperthyroidism for operation, factors of safety with especial reference to the use of iodine.
R. F. BARBER. Test for circulatory efficiency in extremities.
S. P. BARTLEY. Complications and dislocations of the shoulder joint with end results.
A. GOETSCH. Results of combined treatment with X-ray and the administration of Lugol's solution in early hyperplasias of the thyroid.
R. F. HARLOE. The surgical treatment of bilateral empyema.
B. M. CASSEL. Thyroductal anomalies, pathology and surgical treatment.
E. J. BROWDER. Diagnosis and treatment of brain abscess.
E. P. DUNN. Suppurative mediastinitis, presentation of a case.
D. A. MULVIHILL. Malignancy of the thyroid gland, report on a study of 27 cases.
E. J. GRACE. A study in tissue culture, 45 malignant and non-malignant tumors.

NORWEGIAN LUTHERAN HOSPITAL

E. FERRIS, E. SKELTON, D. LIVINGSTONE, L. STORK, P. PLATOU, B. HARRIS, J. H. B. DOWD, G. HUNTER, and J. J. MASTERSON—9. General surgical, gynecological and orthopedic operations; ward rounds; X-ray exhibit.
E. FERRIS—2. Treatment of fractures by open and closed reduction.
D. LIVINGSTONE—2:30. Hypertrophic pyloric stenosis in newborn.
E. SKELTON—3. Perforated peptic ulcers.
B. HARRIS—3:30. Management of cervical stenosis in labor.
P. PLATOU—4. Spinal anæsthesia.

KINGSTON AVENUE HOSPITAL

Staff. Dry clinics and exhibition of cases.
RALPH F. HARLOE. Treatment of empyema.

ST. PETER'S HOSPITAL

MATTHEW G. GOLDEN. Bronchoscopic diagnosis of diseases of the respiratory tract, lantern slides.
T. A. MCGOLDRICK. Clinical considerations in above cases.
CORNELIUS SCHMID. Operability in thyroid disease.
HARRY MCTAGUE. Arterial occlusion in cardiac arrhythmia with gangrene of an extremity; carcinoma of the thymus gland.
HAROLD DENMAN. Syphilis of the lung.
NUNZIO RINI. Experiences in spinal anæsthesia.
SAMUEL SCUDERI. Pancreatic cyst.
LOUIS BERGER. Clinical management of acute intestinal obstruction.
JOSEPH TODD. Treatment of sterility in the female with end results.
WILFRED EGAN Uterine fibroids—salient points in diagnosis, clinical course and ultimate results.
JOSEPH MCGOLDRICK. Hysterectomy.
WILLIAM ENNIS. An improved method of operative treatment in inguinal hernia.
FREDERIC PAFFARD. Experience in management of abdominal surgical cases.
HENRY MORTON. Abdominopelvic fascia in relation to suprapubic cystotomy.
THOMAS M. BRENNAN. A study of case histories in obstructive jaundice with comment on diagnosis, clinical course and management.
GORDON GIBSON. Conservative treatment of pelvic inflammatory disease.
JOHN E. JENNINGS. Thrombo-angiitis obliterans.
JAMES SHAY. Postoperative pulmonary complications.
LOUIS BREGLIO. Report on a series of cases of acute empyema with conclusions.
HENRY FEINBLATT. Types of hyperthyroidism.
LORNE M. RYAN. Gall-bladder disease.
FRANK RYAN. Demonstration of urological cases.
HERBERT FETT. Demonstration of orthopedic cases.
RICHARD A. RENDICH. Gastro-intestinal diagnosis.

CARSON C. PECK MEMORIAL HOSPITAL

JOHN F. RANKIN—9. General surgical operations.
CHARLES S. COCHRANE and STANLEY D. BANKS—9. General surgical operations.
MERRILL N. FOOTE—9. General surgical operations.
WILLIAM W. HALA—9. Exhibition of specimens and newer laboratory tests for pregnancy.
CHARLES EASTMOND—10. Radiographic study of gastro-intestinal obstruction.
H. C. ALLEN, R. L. WOOD, and O. A. GORDON, JR.—2. Obstetrical conference on spinal anæsthesia in obstetrics, exhibition of cases.
HERBERT T. WIKLE—2. General surgical operations.
THEODORE L. VOSSELER and CARLETON CAMPBELL—2. A study of peritonitis.

BUSHWICK HOSPITAL

G. H. REICHERS and staff, P. E. SMITH, G. KASPER and staff, and H. W. BENOIT—9 and 1. General surgical operations.
W. E. LIPPOLD and staff and H. W. DANGLER—9. Gynecological operations.
NATHAN ADLER—10. Emergency obstetrics.
R. C. WEITHAS—11. Genito-urinary operations.
B. F. MAGGIO—11. Treatment of fractures.
W. E. LIPPOLD and S. SCHUSSHEIM—2. Spinal anæsthesia, follow-up clinic.
M. WEISSBERG and EMIL KOCH—2. Pathological conference.

ST. MARY'S HOSPITAL

Staff—9. Operative clinics in general surgery, gynecology, urology, proctology, and orthopedics.
Staff—9 and 2. Dry clinics.
R. B. ANDERSON. Urological cases.
W. V. PASCUAL. Gall-bladder cases; abdominal wall infections.
W. MOITRIER, JR. Importance of blood chemistry in surgery.
W. E. MCCOLLOM. Diabetes in surgery.
A. W. MARTIN MARINO. Hirschsprung's disease; chronic ulcerative colitis.
EDWARD P. DUNN. Thyroid disease.
D. E. WELCH. Tendon suture.
CHARLES H. LOUGHRAN and C. A. NOLAN. Improved methods in blood matching.
J. RIZZO and H. MURPHY. Injection treatment of varicose veins.
P. J. DULLIGAN. Vincent's angina; granulocytis angina; gas bacillus infection.
E. J. CRONIN. Unusual complications in acute appendicitis.
E. A. KEYES. Ovarian cyst complicating pregnancy; seventh cæsarean.
M. MURPHY. End results in breech cases.
CHARLES LOUGHRAN. Bandl's ring; cæsarean section.
J. J. COLLINS. Endarteritis obliterans.
F. W. CURRIN. Diseases of the bone.
J. P. MURPHY. Chronic synovitis of knee.
J. P. MURPHY and E. J. GRACE. Relationship of osteogenic sarcoma and radium poisoning.
E. J. GRACE. Graded cancer of breast and prognosis; tissue culture research on surgically excised neoplasms.
R. F. MCNALLY. Bacteriophage washings from urological infections.
WILLIAM MOITRIER, JR. Trichomonis vaginalis infection in relation to gynecology.
T. M. BRENNAN. Acute pancreatitis.
Staff. Fracture clinic.

ST. JOHN'S HOSPITAL
(Long Island City)

WILLIAM J. LAVELLE, S. KLEIN and staff—9. Gastroenterostomy for duodenal ulcer; treatment of fracture of femur by open reduction.
JOHN MCMAHON and staff—9. Abdominal section for deformed pelvis.
J. PAUL MCHUGH, M. WEINSTEIN and staff—11. Hysterectomy for fibroma of the uterus; re-amputation for thrombophlebitis obliterans.
GEORGE C. BIONDI—11. Prostatectomy, second stage operation.
DENNIS E. MCMAHON, I. L. STEIN and staff—1. Cholecystectomy for gall-bladder disease; thoracotomy by closed method for empyema.
HENRY P. MENCKEN—1. Unusual obstetrical cases; use of high forceps.

CONEY ISLAND HOSPITAL

J. EARL MILES. Tubal insufflation with abdomen open.
GEORGE WEBB. Skeletal traction.
D. A. MCATEER. Traumatic shock.
PHILIP GOLDSTEIN. Residual peritonitis.
PAUL WESENBERG. Difficult labor.
ARTHUR C. GRAVES. Conservative methods in obstetrics.
WILLIAM B. TATUM. Management of ruptured kidney.
RAY M. BOWLES. Suprapubic vs. perineal prostatectomy.
A. J. MENDELSOHN. X-ray demonstration of bone tumors.

CUMBERLAND HOSPITAL

H. WIKLE—9:15. Peri-arterial sympathectomy, moving picture demonstration.
JOHN GAINEY and staff—9:15. General surgical operations.
J. E. JENNINGS and MERRILL N. FOOTE—9:30. General surgical clinic.
FUAD I. SHATARA—10:30. Demonstration of the Russell-Balance traction apparatus for treatment of fractures of femur, with exhibition of patients; review of the injection treatment for varicose veins as compared with operative treatment, exhibition of patients; general surgical operations.
MERRILL N. FOOTE and staff—10:30. General surgical operations.
JOHN E. JENNINGS—11:30. General surgical operations.
MERRILL N. FOOTE and M. J. FEIN—11:30. Histopathology of goiter.
H. WIKLE and staff—11:30. General surgical operations.
JOHN GAINEY—12. Surgery for the cancer patient, analysis and end results.
M. J. FEIN—2. Gross pathology as related to the surgeon, specimens, lantern slides.
JOHN E. JENNINGS, MERRILL N. FOOTE, CHESTER DAVIDSON and JOHN GAINEY—2. Demonstration of interesting cases.
ROBERT KINLOCK—2:30. Transplantation of the ureters with exhibition of patients.
FREDERICK ELLIOT—3. Radiography as related to general surgery, diagnosis and prognosis discussed and illustrated by moving pictures; head, neck, chest, abdomen and fractures; especial reference to intestinal obstruction.
CHESTER DAVIDSON—4. Surgical treatment of unusual cases.

JEWISH HOSPITAL

WILLIAM LINDER, WILLIAM WOLFSON, SAM LINDER and staff. Cancer of the colon; operation.
JOHN LINDER, A. H. IASON, LOUIS BERGER and staff. Gastric resection for ulcer and cancer of stomach.
HENRY W. LOURIA. Thyroid surgery.
A. RAVICH. Lithotriptoscopy and urological operations.
B. E. WOLFORT. End results in bone grafting and elbow fractures.
BENJAMIN KOVEN and MORRIS KOVEN. Fundamental laws in treatment of fractures.
BENJAMIN KRAMER. Dietetic management of intestinal indigestion, calcification in vitro, moving picture demonstration.
ADOLPH BONNER. Treatment of carcinoma of cervix.
M. G. WASCH. Radiological demonstration of metastatic disease of bone; malignancy of bone, pre- and post-radiation; multiple giant cell tumor; pneumoperitoneum; gastro-intestinal studies.
MAX LEDERER. Demonstrations and exhibits from department of pathology.
I. SANDS. Varieties of brain abscess.
M. ROSENZWEIG. Aschheim-Zondek test for pregnancy.
M. CARNES and H. RASCHOFF. Pediatric, surgical and obstetrical pathology.
W. Z. FRADKIN. Portable CO_2 apparatus.
A. S. WIENER. Tests of newborn for parentage.
M. LEDERER. Pathological conference.
S. H. POLAYES. Blood transfusion.

HOUSE OF ST. GILES

CHARLES D. NAPIER and JOSEPH B. L'EPISCOPO—2. Exhibition of orthopedic cases.

METHODIST EPISCOPAL HOSPITAL

Staff—9 a.m. and 2 p.m. Operative and dry clinics.
C. H. GOODRICH and R. F. SEIDENSTICKER. End results following goiter operations.
H. T. LANGWORTHY. Tumors of the kidney.
H. K. BELL. Acute osteomyelitis.
D. E. MCKENNA. Dislocation of cervical vertebra, exhibition of case.
E. J. BROWDER. Management of peripheral nerve injuries with end results and exhibition of cases.
CLAUDE C. KELLY (Hartford). Plastic surgery, lantern slide demonstration.
FRED RANKIN (Mayo Clinic). Dry clinic.
S. G. CLARK. Ectopic pregnancy rupturing into the sigmoid.
J. H. BLISS. Rôle of calcium metabolism in hyperthyroidism.
J. A. TIMM. Injection treatment of varicose veins.

Symposium on Gall-Bladder Disease

O. P. SCHOENEMANN. Anatomy of biliary tract.
E. B. SMITH. Pathology of gall bladder and liver.
H. GRAHAM. Early operation for acute cholecystitis.
RUSSELL FOWLER. Unusual gall-bladder cases.
F. B. CROSS. Pre- and postoperative use of glucose, exhibition of cases.
P. A. RENAUD. Cholecystectomy without drainage.

Symposium on Obstetrics

O. P. HUMPSTONE. Cæsarean section in the treatment of bleeding during pregnancy.
R. M. BEACH. Medial versus lateral episiotomy, moving picture demonstration.
H. B. MATTHEWS. Management of pregnancy in the presence of pulmonary tuberculosis.
H. W. MAYES. Vaginal versus rectal examinations in relation to obstetrical morbidity.

LUTHERAN HOSPITAL

A. VON P. FARDELMANN—10. Hypertrophic pyloric stenosis in infants—history, diagnosis, treatment, and results; presentation of cases.
WALTER LYNN—10:30. Operative gall bladder mortality.
DELFINO MASCOLO—11. Subphrenic abscess; cases.
PAUL RAIA—11:15. Fibromata of intestines, pathological and lantern slide demonstration.
VINCENT BARBER—11:30. Lipoma of intestine causing intussusception.
EMIL F. KOCH—2. Pathological demonstration.
H. C. EICHACKER—2. Discussion of eclampsia.
HEINRICH WEHRBEIN and ALBERT L. VOLTZ—2:30. Interesting types of urinary tract pathology.
V. GIANTIERI—2:30. Leucorrhea.
ALBERT L. VOLTZ—2:30. X-ray demonstration: Types of mastoids roentgenologically considered; chest differential diagnosis, X-ray diagnosis; X-ray diagnosis of bleeding ulcer by use of hydrogen peroxide (Dr. L. Dinken method, Berlin); unusual cases of general interest.
H. C. EICHACKER—2:45. Cæsarean section, review of cases.
CAMERON DUNCAN—3. Uterine bleeding, lantern slide demonstration.

GREENPOINT AND ST. CATHERINE'S HOSPITALS

FRANK D. JENNINGS and FRANK TARSNEY. Demonstration of "pelvic hammock," a new device for rhythmic traction in the treatment of fractures.
JOHN M. SCANNELL. Demonstration of method and technique of blood transfusion.
FRANK D. JENNINGS. Consideration of inguinal hernia.

WYCKOFF HEIGHTS HOSPITAL

JOHN G. KRAUSS, JOHN HORNI, RUSSELL S. FOWLER, and CHARLES PFLUG—9. General surgical operations.
J. ARTHUR BUCHANAN—9:45. A surgical purpura.
LEO LEFKOWITZ—10. Syphilis of the liver.
ALBERT COOK—10:15. Diverticulitis.
GEORGE FORBES—10:30. X-ray demonstration on pneumothorax.
DAVID GINGOLD—10:45. Pyloric stenosis in infants.
CARL FISCHER—11. Ruptured uterus at term; fetus in abdominal cavity; cæsarian section.
RUDOLPH HERRIMAN—11:15. Cæsarian section, moving picture demonstration.
WILLIAM B. ROSECRANS—11:30. Fractures of the skull, paralysis, operation and recovery.
CHARLES PFLUG—11:45. The more common dislocations.
WILLIAM BOZENHARDT—12. Papillo-adenoma of kidney, metastasis in bladder one year later.
E. C. BERNAUER—12:15. Impetigo in obstetrical work, lantern slide demonstration.
L. DREXLER—1:30. Renal carbuncle, moving pictures.
J. G. KRAUSS—1:45. Foreign body in knee joint, magnet.
WILLIAM COOK, KARL MUELLER, JR., RUDOLPH HERRIMAN, and ARTHUR HOLZMAN—2. General surgical operations.
JOHN HORNI—2:15. Subtotal resection of stomach.
THURSTON DEXTER—2:30. Pathology of gall bladder disease.
CHRISTIAN JANSEN—2:45. Evaluation of the various liver function tests.
ARTHUR HOLZMAN—3. Anomalies of cystic and hepatic arteries.
RUSSELL S. FOWLER—3:15. Intractable abdominal sinus.
WILLIAM LAING—3:30. Diabetes mellitus, suppurative osteomyelitis of first metatarsal, surgical cure.
ROSARIO MULÉ—3:45. Genito-urinary cases.

ST. JOHN'S HOSPITAL

GLEN R. MACLACHLAN—9. Report on breech deliveries.
CHARLES W. MUELLER—10. Management of placenta prævia.
CAMERON DUNCAN—10:30. Cervical dystocia in elderly primipara.
ALFRED W. WHITE—11. Resumé of two years obstetrical work.
ONSLOW A. GORDON—11:30. Discussion of ward cases.
GEORGE R. MARSH—12. Clinical study of inguinal hernia with end results.
STANLEY B. THOMAS—2. Cancer of the rectosigmoid, choice of operation.
ROBERT B. ANDERSON—2:30. Is nephrectomy indicated in the unilateral closed tuberculous kidney?
JOHN E. JENNINGS—3. Surgery of the terminal ileum.
AUGUSTUS HARRIS—3:30. A general consideration of fibrous vesical neck obstruction.
G. FRANK SAMMIS—4. Consideration of full thickness (tube) graft and fascial transplant.
WARREN L. DUFFIELD—4:30. Clinical review of cases of pericolic membranes.

NORTH COUNTRY COMMUNITY HOSPITAL

(Glen Cove)

A. M. BELL, W. I. TITUS, G. L. FAIR, and M. J. DUNNE—9. Obstetrical clinic.
R. DERBY, J. W. BULMER, M. W. JACKSON, G. D. DURYEA, J. L. NEUBERT, and A. F. ROWSOM—9:30. General surgical clinic.
E. C. JESSUP, N. C. STEVENS, R. E. LEASE, E. C. BRAYNARD, and F. C. EDMONDS—10:30. Medical clinic.
L. D. LARIMORE—11:30. Laboratory demonstration.

BROOKLYN HOSPITAL

W. A. SHERWOOD, E. K. TANNER, W. H. FIELD, and J. B. GIVEN, JR.—9. General surgical operations and demonstration of cases.
V. L. ZIMMERMAN, E. BISHOP, and W. S. SMITH—9. Gynecological and obstetrical operations and demonstration of cases.
N. P. RATHBUN and W. F. MCKENNA—9. Cystoscopic clinic.
Staff—11. Demonstration of urological X-rays.
W. A. SHERWOOD and JAMES DENTON—12. Surgical pathological conference.
D. E. MCKENNA—12:30. Orthopedic operations and demonstration of cases.
J. E. JENNINGS—2. General surgery dry clinic with demonstration of cases.
N. P. RATHBUN and W. F. MCKENNA—2. Urological operations.

FLUSHING HOSPITAL

(Flushing)

J. S. THOMAS—9:30. General surgical operations.
A. S. LOWSLEY and W. K. ROGERS—9:30. General surgical clinic.
G. J. J. LAWRENCE and J. L. MORRISSEY—9:30. Gynecological operations.

NASSAU HOSPITAL

(Mineola)

Staff—9. General surgical operations.

QUEENSBORO SURGICAL SOCIETY

Special meeting at 3:30 p.m. in the building of the Queens County Medical Society, 112 Queens Boulevard.
EDWARD L. KEYES. The principles of prostatic surgery.
MARTIN B. TINKER, Ithaca, N. Y. Important points in the technique of goiter operations.

CLINICS IN BROOKLYN AND LONG ISLAND HOSPITALS

WYCKOFF HEIGHTS HOSPITAL

Tuesday

JOHN L. BAUER—9. General surgery.
JOHN G. KRAUSS—9. General surgery.
RUSSELL S. FOWLER—10. General surgery.
ARTHUR HOLZMAN—10. General surgery.
WILLIAM B. ROSECRANS—10. General surgery.
RUDOLPH HERRIMAN—2. Obstetrics.
CARL O. FISCHER—3. Obstetrics.
ROSARIO MULÉ—4. Urological operations.

Thursday

JOHN L. BAUER—9. General surgery.
JOHN G. KRAUSS—9. General surgery.
RUSSELL S. FOWLER—10. General surgery.
ARTHUR HOLZMAN—10. General surgery.
WILLIAM B. ROSECRANS—10. General surgery.
RUDOLPH HERRIMAN—2. Obstetrics.
CARL O. FISCHER—3. Obstetrics.
ROSARIO MULÉ—4. Urological operations.

Friday

ALBERT G. COOK—9. General surgery.
WILLIAM F. BOZENHARDT—9. General surgery.
WILLIAM COOK—9. General surgery.
JOHN HORIN—11. General surgery.
CHARLES PFLUG—11. General surgery.
LEO DREXLER—2. Urological operations.
GEORGE FORBES—2. X-ray clinic.
HENRY DIRLAM—3. Obstetrics.

BROOKLYN HOSPITAL

Tuesday

W. A. SHERWOOD—9. General surgical operations.
V. L. ZIMMERMAN and staff—9. Obstetrical and gynecological clinic and conference.

Thursday

W. A. SHERWOOD—9. General surgical operations.
JOHN E. JENNINGS—9. General surgical operations.
N. P. RATHBUN—9. Cystoscopic clinic.
D. E. MCKENNA—10:30. Orthopedic operations.

Friday

W. A. SHERWOOD—9. General surgical operations.
N. P. RATHBUN—9. Urological operations.
V. L. ZIMMERMAN—9. Gynecological operations.
JAMES DENTON—11. Clinical surgical pathological conference.

KINGS COUNTY HOSPITAL

Tuesday

E. H. FISKE, J. TENOPYR, and J. RAPHAEL—9. General surgery.
R. M. ROME, W. E. ENNIS, and H. W. BENOIT—9. General surgery.
H. E. FRASER and C. S. COCHRANE—2. Genito-urinary operations.
R. A. RENDICH—2. X-ray demonstration.

Thursday

E. H. FISKE, J. TENOPYR, and J. RAPHAEL—9. General surgery.
R. M. ROME, W. E. ENNIS, and H. W. BENOIT—9. General surgery.
C. D. NAPIER, R. C. WILLIAMS, and J. B. L'EPISCOPO—2. Orthopedics.

Friday

S. J. MCNAMARA and R. H. GARLICK—9. Gynecology.
H. M. MILLS—9. Obstetrics.
C. DUNCAN and C. E. RYND—9. Gynecology and obstetrics.
H. E. FRASER and C. S. COCHRANE—2. Genito-urinary surgery.
C. F. MCCARTHY—2. Physiotherapy clinic.

NORWEGIAN LUTHERAN DEACONESSES' HOSPITAL

Tuesday

E. FERRIS—9. General surgery.
G. HUNTER—9. Orthopedics.
C. LANGE—11. Genito-urinary surgery.
D. LIVINGSTONE—11. General surgery.
E. FERRIS, J. H. B. DOWD, and C. LANGE—2. Dry clinic.

Thursday

W. B. DUKESHIRE and P. PLATOU—9. General surgery.
ROBERT W. TATE—10. General surgery.
J. H. B. DOWD—11. Obstetrics.
W. B. DUKESHIRE, P. PLATOU and B. HARRIS—2. Dry clinic.

Friday

H. A. FISHER—9. Genito-urinary surgery.
R. P. SAN FILIPPO—9. General surgery.
WILLIAM G. FLICKINGER—10. General surgery.
WILLIAM G. FLICKINGER, R. P. SAN FILIPPO, ROBERT W. TATE, and H. A. MEHLDAU—2. Dry clinic.

LONG ISLAND COLLEGE HOSPITAL

Tuesday

William A. Jewett, Gordon Gibson, H. B. Matthews, and A. C. Beck—9. Obstetrics and gynecology.
J. D. Rushmore—9. Orthopedics.

Thursday

W. A. Jewett, Gordon Gibson, H. B. Matthews, and A. C. Beck—9. Obstetrics and gynecology.
J. D. Rushmore—9. Orthopedics.
J. S. Read, F. L. Senger, and A. L. Harris—2. Urology.

Friday

Emil Goetsch, R. F. Barber, S. P. Bartley, Arthur Goetsch, and R. F. Harloe—9. General surgery.
J. D. Rushmore—9. Orthopedics.
J. S. Read, F. L. Senger, and A. L. Harris—2. Urology.

ST. JOHN'S HOSPITAL

Tuesday

Warren L. Duffield—9. General surgery.
Stanley B. Thomas—9. General surgery.
Robert B. Anderson—10. Genito-urinary operations.
Onslow A. Gordon, Jr.—2. Obstetrics.

Thursday

Robert B. Anderson—9. Genito-urinary operations.
Stanley B. Thomas—9. General surgery.
Cameron Duncan—2. Obstetrics.

Friday

G. Frank Sammis—9. General surgery.
Warren L. Duffield—9. General surgery.
Harold K. Bell—9. General surgery.

CUMBERLAND HOSPITAL

Tuesday

John Gainey and staff—10. Cancer clinic, operations and demonstration of cases.

Thursday

Merrill N. Foote and staff—9. Goiter clinic, operations and demonstration of cases.
Robert E. Kinlock and staff—2. Urological clinic, operations and demonstration of cases.

Friday

John E. Jennings—9. General surgery, dry clinic.
Merrill N. Foote and F. T. Shatara—2. Varicose vein clinic.

LUTHERAN HOSPITAL

Tuesday

A. V. P. Fardelmann—9. General surgery.
N. P. Rathbun—9. Urological clinic.

Thursday

Vincent Barber—9. General surgery.
Cameron Duncan—9. Gynecology.

Friday

Edward May—9. Obstetrics.

HOLY FAMILY HOSPITAL

Tuesday

James M. Downey—9. General surgical operations.

Thursday

Joseph S. Baldwin—9. General surgical operations.

ST. MARY'S HOSPITAL

Tuesday

William V. Pascual—9. General surgery.
P. J. Dulligan—9. General surgery.
E. A. Keyes—9. Gynecology.
R. B. Anderson—9. Urology.
Staff—2. Fracture clinic.

Thursday

William V. Pascual—9. General surgery.
P. J. Dulligan—9. General surgery.
E. A. Keyes—9. Gynecology.
R. B. Anderson—9. Urology.
Staff—2. General surgery dry clinic, transfusion.

Friday

J. P. Murphy—9. General surgery.
T. M. Brennan—9. General surgery.
J. P. Glynn—9. Gynecology.
T. A. Shields—9. Proctology.

ST. PETER'S HOSPITAL

Tuesday

Gordon Gibson—9. Gynecology.
J. Todd—9. Gynecology.
H. Fett—9. Orthopedics.
H. Morton—2. Genito-urinary operations.

Thursday

J. E. Jennings—9. General surgery.
T. M. Brennan—9. General surgery.
F. Paffard—9. General surgery.
W. Ennis—9. Traumatic surgery.
H. Morton—2. Genito-urinary operations.

Friday

Gordon Gibson—9. Gynecology.
J. Todd—9. Gynecology.
H. Fett—9. Orthopedics.
H. Morton—2. Genito-urinary operations.

MARY IMMACULATE HOSPITAL

(Jamaica)

Tuesday

Frank M. Dealy—9. General surgery.

Thursday

Louis Licht—9. General surgery.
Robert B. Anderson—9. Genito-urinary surgery.
Emil F. Koch—2. Surgical pathology.

Friday

John M. Scannell—9. General surgery and spinal anæsthesia demonstrations.
Allen Robinson—2. Radium therapy.

NORTH COUNTRY COMMUNITY HOSPITAL

(Glen Cove)

Tuesday

A. M. Bell—9. Operative obstetrics.
E. C. Jessup—9. Medical demonstrations.

Thursday

M. C. Hill—9. Pediatrics.
G. F. Hoch—9. Urological operations.

Friday

L. D. Larimore—9. Laboratory demonstration.

METHODIST EPISCOPAL HOSPITAL

Tuesday

R. S. Fowler, T. B. Spence, C. H. Goodrich, and H. K. Bell—9. General surgery.
O. P. Humpstone and H. B. Matthews—9. Obstetrics.

Thursday

H. T. Langworthy—9. Urological clinic.
R. S. Fowler, T. B. Spence, C. H. Goodrich, R. F. Seidensticker, H. K. Bell—9. General surgery.
O. P. Humpstone and H. B. Matthews—9. Obstetrics.

Friday

H. F. Graham, A. H. Bogart, and P. A. Renaud—9. General surgery.
R. M. Beach and H. W. Mayes—9. Obstetrics.

CALEDONIAN HOSPITAL

Tuesday

Calvin Barber—9. General surgical operations.
Joseph Tenopyr—9. General surgery, dry clinic.

Thursday

Calvin Barber—9. General surgery.
Joseph Tenopyr—9. General surgery, dry clinic.

Friday

William A. Jewett—9. Obstetrics.
Joseph Tenopyr—9. Fracture clinic.
Charles S. Cochrane—2. Genito-urinary operations.

NASSAU HOSPITAL

(Mineola)

Tuesday

W. M. Post and A. S. Warinner—9. General surgery.
W. L. Sneed—9. Orthopedic operations.

Thursday

H. C. Martin—9. Obstetrics and gynecology.
G. F. Cleghorn—9. General surgery.
J. W. McChesney—9. Urology.

Friday

G. F. Cleghorn and W. S. S. Horton—9. General surgery.

GREENPOINT HOSPITAL

Tuesday

A. L. Soresi—9. General surgery.
Charles A. Gordon—2. Gynecological clinic.

Thursday

John Smith, Jr.—9. General surgery.
Emil F. Koch—2. Pathological demonstration.

Friday

Joseph S. Baldwin—9. General surgery.

ST. CATHERINE'S HOSPITAL

Tuesday

John M. Scannell and Frank D. Jennings—9. General surgery.

Thursday

Charles A. Gordon—9. Gynecology.

Friday

Martin L. Bodkin—9. Rectal surgery.
Daniel A. McAteer—9. General surgery.

BUSHWICK HOSPITAL

Tuesday

Harry W. Dangler—9. Gynecological clinic.
Richard C. Weithas—2. Genito-urinary clinic.

Thursday

Nathan H. Adler—9. Emergency obstetrics and ward rounds.
W. E. Lippold and S. S. Schussheim—9. Gynecological clinic.
Gerard Kasper—2. General surgery.

Friday

H. Wright Benoit—9. General surgery.

ST. JOHN'S HOSPITAL

(Long Island City)

Tuesday

D. E. McMahon, I. L. Stein, and staff—9. General surgical operations.
J. J. McMahon and staff—2. Gynecological operations.

Thursday

W. J. Lavelle, S. M. Cohen, and staff—9. General surgical operations.
G. C. Biondi and staff—2. Urological operations.

Friday

D. E. McMahon, I. L. Stein, and staff—9. General surgical operations.

JAMAICA HOSPITAL

(Richmond Hill)

Tuesday

H. W. Barber—9. General surgical operations.
H. C. Courten—2. Orthopedic operations.

Thursday

L. H. Moss—9. General surgical operations.
A. L. Voltz—2. X-ray conference.

Friday

H. W. Neail—9. Gynecological operations.
A. E. Baker—9. Obstetrical operations.
H. C. Courten and A. L. Voltz—2. Fracture and X-ray conference.

JEWISH HOSPITAL

Tuesday

John Linder—9. General surgery.
Leo S. Schwartz—2. Gynecological operations.

Thursday

John Linder—9. General surgery.
Leo S. Schwartz—2. Gynecological operations.

Friday

William Linder—9. General surgery.
Adolph Bonner—2. Gynecological operations.

HOUSE OF ST. GILES THE CRIPPLE

Tuesday

Joseph B. L'Episcopo and Charles Dwight Napier—10. Orthopedic clinic.

Thursday

Joseph B. L'Episcopo and Charles Dwight Napier—10. Orthopedic clinic.

CONEY ISLAND HOSPITAL

Tuesday

J. Earl Miles—9:30. Gynecology.
John H. Crawford—2. Pre- and postoperative care of the cardiac patient.
Ray M. Bowles—2. Preparation of the patient in prostate cases.
J. Earl Miles—2. Miles modification of the Rubin test.
Arthur C. Graves—2. Postpartum hæmorrhage.

Thursday

George Webb and J. Earl Miles—9. General surgical clinic.
P. I. Nash—2. Pre- and postoperative treatment of diabetic patients.
George Webb—2. Traumatic surgery.
George G. Fisher—2. Biliary surgery, common duct stones.

KINGSTON AVENUE HOSPITAL

Thursday

Ralph F. Harloe—2. Empyemas complicating contagious diseases.

FLUSHING HOSPITAL

(Flushing)

Tuesday

G. J. J. Lawrence—9:30. Gynecological operations.
J. W. Wickham—9:30. General surgical operations.
J. L. Morrissey—11. Gynecological operations.
J. S. Thomas—11. General surgical operations.

Thursday

J. S. Thomas, W. K. Rogers, and J. DeR. Combes—9:30. Fracture demonstration.
G. J. J. Lawrence and J. L. Morrissey—9:30. Gynecological operations.

CARSON C. PECK MEMORIAL HOSPITAL

Tuesday

J. F. Ranken—9. General surgical operations.
O. A. Gordon, Jr.—2. Obstetrics.

Thursday

T. L. Vosseler—9. General surgical operations.

Friday

H. T. Wikle—9. General surgical operations.

SURGERY OF THE EYE, EAR, NOSE AND THROAT

CLINICS IN NEW YORK HOSPITALS

BELLEVUE HOSPITAL

Monday

William B. Doherty and E. B. Gresser—2. Eye operations.
R. T. Atkins—2. Ear, nose and throat operations.

Tuesday

John Miller and E. H. Moyle—10. Bronchoscopic clinic.
W. C. Bowers—2. Ear, nose and throat operations.
S. A. Agatson and E. A. Tusak—2. Eye operations.

Wednesday

Webb W. Weeks, E. B. Gresser and A. E. Town—9. Pathological eye specimens, gross and microscopic.
J. W. Fowlkes—10. Postoperative mastoid clinic.
John Miller—2. Laryngological clinic.
Webb W. Weeks, William B. Doherty, S. P. Oast and S. A. Agatson—2. Eye operations.
C. J. Imperatori—3. Bronchoscopic clinic.

Thursday

Webb W. Weeks and S. A. Agatson—9. Ophthalmoscopic cases.
E. H. Moyle—10. Anatomical demonstration, ear, nose and throat specimens.
J. W. Fowlkes and V. C. McCuaig—2. Ear, nose and throat operations.
S. P. Oast and E. A. Tusak—2. Eye operations.

Friday

Webb W. Weeks, E. B. Gresser and A. E. Town—9. Pathological eye specimens, gross and microscopic.
John Guttman—9. Neuro-otology.
Edgar M. Pope and J. Swift Hanley—2. Ear, nose and throat operations.
E. B. Gresser and Webb W. Weeks—2. Eye operations.

LIGHTHOUSE EYE CLINIC

Tuesday

Conrad Berens—9. Operations for retinal detachment (lantern slide demonstration).
H. J. Ross—10. Relation of dental infections to diseases of the eye (lantern slide demonstration).
Paul T. Connolly and Ervin A. Tusak—11. Demonstration of unusual clinical and operative cases.

Wednesday

Conrad Berens—9. Operations for heterotropia and hetarophoria; retroplacement, resection and tenotomy of inferior oblique (lantern slide demonstration).
LeGrand H. Hardy—10. Practical points in perimetry and campimetry (lantern slide demonstration).
Adolf Posner—11. Embryologic interpretation of certain developmental anomalies of the eye (lantern slide demonstration).

Thursday

James M. Evans—9. Relation of upper respiratory infections to diseases of eye (lantern slide demonstration).
Elizabeth K. Stark—10. Clinical perimetry (lantern slide demonstration).
Ervin A. Tusak—11. Clinical consideration of ocular tumors.

Friday

Conrad Berens and Elizabeth K. Stark—9. Ocular fatigue (lantern slide demonstration).
Paul T. Connolly and Dorothy Kern—10. Orthoptic training.
Olga Sitcherska—11. Kerotoconus and contact lenses with presentation of cases.

HARLEM HOSPITAL

Wednesday

L. Hubby—2. Otolaryngology.

NEW YORK POST-GRADUATE HOSPITAL

Monday

ROBERT BUCKLEY—2. Laryngectomy or pharyngotomy for malignancy.
CLARENCE H. SMITH and staff—2. Otological operations.
E. M. ALGER—3:30. Eye operations and demonstration of cases.
LOUISE H. MEEKER—4. Pathology of nose and throat.

Tuesday

L. H. MEEKER—9. Pathological lantern slide demonstration of eye cases.
C. J. IMPERATORI—9. Bronchoscopy.
MARVIN F. JONES—10. Histological examination of the temporal bone in serial sections.
ARTHUR NILSEN—11. Ethmoid sinus operations.
G. ALLEN ROBINSON—2. Demonstration of radium as a therapeutic agent.
MARVIN F. JONES and staff—2. Otological operations.
C. M. GRIFFITH—3. Caldwell-Luc and Denker operations.
MARTIN COHEN—3:30. Eye operations and demonstration of cases.

Wednesday

JAMES W. WHITE and R. AEBLI—9. Eye muscle operations; muscular anomalies.
VICTOR ANDERSON—9. Neck dissection and demonstration of surgical anatomy.
RAYMOND J. GAFFNEY—9. Otological operations.
ROBERT BUCKLEY—2. Laryngectomy and pharyngotomy with removal of hyoid as approach for malignancy.
GUSTAV AUFRECHT—2. Rib transplant for nasal deformity.
CLARENCE H. SMITH and staff—2. Otological operations.
DAVID ALPERIN—3:30. Eye operations and demonstration of cases.

Thursday

L. H. MEEKER—9. Pathological conditions of the eye (lantern slide demonstration).
C. J. IMPERATORI—9. Opaque foreign bodies (lantern slide demonstration).
DUNCAN MACPHERSON—10. Frontal sinus operations.
MARVIN F. JONES—10. Histological examination of the temporal bone in serial sections.
ARTHUR NILSEN—2. Caldwell-Luc operation.
C. J. IMPERATORI—2. Endoscopy and laryngeal operations.
MARVIN F. JONES and staff—2. Otological operations.
MARTIN COHEN—3:30. Eye operations and demonstration of cases.

Friday

J. W. WHITE and R. AEBLI—9. Eye muscle operations; muscular anomalies.
T. J. HARRIS—9. Tuberculosis of larynx (lantern slides).
R. H. HUTCHINSON, JR.—10. Cochlear, audiometric and vestibular tests.
E. M. ALGER—3:30. Eye operations and demonstration of cases.

BRONX HOSPITAL

Monday

N. GOODFRIEND—2. Ophthalmology.

Wednesday

M. J. BALLIN—2. Otolaryngology.

Thursday

M. J. BALLIN—2. Otolaryngology.

MANHATTAN EYE, EAR AND THROAT HOSPITAL

Monday

H. W. WOOTTON and L. W. CRIGLER—2. Eye operations.

Tuesday

DAVID JONES—12:30. Tonsil clinic.
JOHN R. PAGE and staff—2. Ear clinic.
ROSS FAULKNER and staff—2. Nose and throat clinic.
F. M. LOW—2. Demonstration of X-ray.
A. J. EGGSTON—2. Demonstration of pathology.
H. R. SKEEL and G. W. FREY, JR.—2. Eye operations.

Wednesday

G. ALLEN ROBINSON—9. Demonstration of use of radium in ear, nose and throat malignant tumors.
DAVID JONES—12:30. Tonsil clinic.
A. B. DUELL and staff—2. Ear clinic.
HARMON SMITH and staff—2. Nose and throat clinic.
E. M. LOW—2. X-ray demonstration.
A. J. EGGSTON—2. Pathological demonstration.
S. C. KEIL and A. D. MITTENDORF—2. Eye operations.

Thursday

C. J. IMPERATORI—10. Bronchoscopic clinic.
DAVID JONES—12:30. Tonsil clinic.
E. P. FOWLER and staff—2. Ear clinic.
FRANCIS WHITE and staff—2. Nose and throat clinic.
E. P. FOWLER—2. Clinical research of ear.
N. DEL. L. FLETCHER and J. S. VAN FLEET—2. Eye operations.

Friday

G. ALLEN ROBINSON—9. Demonstration of use of radium in ear, nose and throat benign tumors.
DAVID JONES—12:30. Tonsil clinic.
JOHN RAE—2. Ear clinic.
J. E. MACKENTY—2. Nose and throat clinic.
D. H. WEBSTER and M. COHEN—2. Eye operations.

MT. SINAI HOSPITAL

Monday

SIDNEY YANKAUER, MERWIN MYERSON and RUDOLPH KRAMER—2. Bronchoscopy.
J. WOLFF, K. SCHLIVEK and I. GOLDSTEIN—2. Eye clinic.

Tuesday

I. FRIESNER, J. MAYBAUM, WALTER HORN, S. ROSEN, JOSEPH G. DRUSS and HARRY ROSENWASSER—9. Ear operations and demonstration of cases.
I. GOLDSTEIN—10. Ocular pathology.
SIDNEY YANKAUER, MERWIN MYERSON and RUDOLPH KRAMER—2. Nose and throat clinic.

Wednesday

I. FRIESNER, J. MAYBAUM, WALTER HORN, S. ROSEN, JOSEPH G. DRUSS and HARRY ROSENWASSER—9. Ear operations and demonstration of cases.
R. LAMBERT—10. Fundus photography.

Thursday

I. GOLDSTEIN—10. Ocular pathology.
SIDNEY YANKAUER, MERWIN MYERSON and RUDOLPH KRAMER—2. Bronchoscopy.
J. WOLFF, K. SCHLIVEK and I. GOLDSTEIN—2. Eye clinic.

Friday

H. MINSKY—10. Improved methods of focal illumination and transillumination.
SIDNEY YANKAUER, MERWIN MYERSON and RUDOLPH KRAMER—2. Nose and throat clinic.

NEW YORK EYE AND EAR INFIRMARY

Monday

T. LAURENCE SAUNDERS—2. Ear, nose and throat operations.

CLYDE S. MCDANNALD and TRUMAN L. BOYES—2. Eye operations.

Tuesday

W. W. WEEKS, WENDELL L. HUGHES, MARY LANDIS and R. E. MEEK—9. Demonstration of muscular anomalies; visual field changes; retinal detachment.

G. S. DIXON and I. SCHWARTZ—10. Demonstration of X-ray pictures of mastoid process and nasal accessory sinuses.

B. W. KEY, W. B. DOHERTY, A. GRIMALDI, B. S. BEACH and H. VAN LAMMERS—2. Eye surgery.

J. MORRISSET SMITH—2. Ear, nose and throat operations.

Wednesday

BERNARD SAMUELS, A. B. REESE and E. BURCHELL—9. Sympathetic ophthalmics in relation to site of wound; traumatism to retina and choroid; pigmentation of retina in detachment; anatomy of temporal bone.

E. B. BURCHELL—10. Accessory sinuses, relation to orbit (lantern slide demonstration); bacteriology of ear.

FRANCIS W. SHINE, S. P. OAST, S. A. AGATSON and JESSIE B. STARK—2. Eye surgery.

STUART L. CRAIG—2. Ear, nose and throat operations.

Thursday

CONRAD BERENS and associates—9. Ophthalmological clinic.

E. B. BURCHELL. Anatomy of the accessory sinus, variations and relation to orbit and its contents. Discussion by Conrad Berens.

WILLIS KNIGHTON. Recent advances in cataract surgery with results.

E. J. BASSEN. Glaucoma operations and results.

J. MORRISSET SMITH—9. Mastoid operations, anatomy of facial nerve (demonstration on cadaver).

E. B. BURCHELL—9. Anatomy of temporal bone (lantern slide demonstration).

JOHN MCCOY—2. Ear, nose and throat operations.

W. W. WEEKS, T. H. JOHNSON, W. L. HUGHES, and R. E. MEEK—2. Eye operations.

Friday

CLYDE E. MCDANNALD and TRUMAN L. BOYES—9. Eye clinic.

G. S. DIXON and I. SCHWARTZ—10. Demonstration of X-ray pictures of mastoid process and nasal accessory sinuses.

BERNARD SAMUELS, CONRAD BERENS, ISADORE GOLDSTEIN and WILLIS KNIGHTON—2. Eye operations.

HUGH B. BLACKWELL—2. Ear, nose and throat operations.

LINCOLN HOSPITAL

Tuesday

J. S. HANLEY—2. Otolaryngological operations.

Thursday

H. K. LIGGETT and M. BERGER—2. Otolaryngological operations.

ST. VINCENT'S HOSPITAL

Monday

JOHN D. KERNAN—2. Bronchoscopic clinic.

Tuesday

JOHN M. LORE—2. Bronchoscopic clinic.

PRESBYTERIAN HOSPITAL

Monday

HARRY NEIVERT—2. Ear, nose and throat clinic.

Tuesday

THOMAS H. JOHNSON—10. Eye manifestations of brain conditions.

C. G. COAKLEY—10. Follow-up clinic, ear, nose and throat cases.

JOHN H. DUNNINGTON—2. Eye operations.

LEE R. PIERCE—2. Ear, nose and throat clinic.

JOHN KERNAN—2. Bronchoscopy.

Wednesday

DANIEL B. KIRBY—10. Eye tissue culture demonstrations.

HARRY NEIVERT—10. Anatomical demonstration.

GEORGE R. BRIGHTON—2. Ear, nose and throat clinic.

Thursday

JOHN M. WHEELER—10. Results of eye operations.

JAMES W. BABCOCK—10. Follow-up clinic, ear, nose and throat cases.

JOHN M. WHEELER—2. Eye operations.

CHARLES N. HARPER—2. Ear, nose and throat clinic.

Friday

JOHN H. DUNNINGTON—10. Demonstration of eye muscle conditions.

PAGE NORTHINGTON—10. Studies in deafness.

JOHN H. DUNNINGTON—2. Eye operations.

GEORGE V. BROWNE—2. Ear, nose and throat clinic.

LEBANON HOSPITAL

Monday

M. D. LEDERMAN and ISAAC M. HELLER—2. Otolaryngology.

Friday

M. D. LEDERMAN and ISAAC M. HELLER—2. Otolaryngology.

METROPOLITAN HOSPITAL

Tuesday

A. L. CHAMBERS—4. Surgery of the eye.

Thursday

J. A. W. HETRICK and staff—10. Surgery of the nose, throat and ear.

KNAPP MEMORIAL EYE HOSPITAL

Tuesday

ARNOLD KNAPP and staff—2. Eye operations.

Wednesday

ARNOLD KNAPP and staff—2. Eye operations.

Thursday

ARNOLD KNAPP and staff—2. Eye operations.

MISERICORDIA HOSPITAL

Tuesday

ROBERT E. BUCKLEY—2. Ear, nose and throat operations.

GOUVERNEUR HOSPITAL

Friday

WILLIAM L. GATEWOOD—2. Nose and throat clinic.

NEW YORK POLYCLINIC HOSPITAL

Monday

WILLIAM L. GATEWOOD—2. Nose and throat operations.
ERVIN TOROK—3. Ophthalmology.
JOHN MCCOY and staff—4. Otology.

Tuesday

LEE M. HURD—2. Nose and throat operations.
C. E. MCDANNALD and T. A. NORTHCOTT—3. Ophthalmology.
SAMUEL J. KOPETZKY—4. Otology.

Wednesday

ERVIN TOROK and JOHN RICHARDSON—9. Ophthalmological operations.
WILLIAM L. GATEWOOD—2. Nose and throat clinic.
JOHN MCCOY and staff—4. Otological operations.

Thursday

LEE M. HURD—2. Nose and throat clinic.
C. E. MCDANNALD and T. A. NORTHCOTT—3. Ophthalmological operations.
S. J. KOPETZKY—4. Otological operations.

Friday

LAWRENCE D. REDWAY—9. Colored photography of living eye.
HENRY B. ORTON—2. Bronchoscopy.
ERVIN TOROK—3. Ophthalmology.
JOHN MCCOY and staff—4. Otology.

MORRISANIA HOSPITAL

Tuesday

C. SMITH—2. Otolaryngological operations.

Wednesday

T. H. CURTIN—9. Ophthalmological operations.

Thursday

DAVID H. JONES—2. Bronchoscopic clinic.

FORDHAM HOSPITAL

Tuesday

JOSEPH D. KELLY—9. Otolaryngological operations.

Wednesday

S. H. BASCH—9. Otolaryngological operations.

Friday

H. G. WINCOR—9. Ophthalmological operations.

CITY HOSPITAL

Monday

A. N. SCHILLER—2. Ear, nose and throat clinic.

Thursday

O. C. RISCH—2. Ear, nose and throat clinic.

FIFTH AVENUE HOSPITAL

Thursday

WESTLEY M. HUNT—2. Otolaryngological operations and demonstration of cases.

Friday

LEGRAND H. HARDY and Z. H. ELLIS—2. Ophthalmological operations and demonstration of cases.

BETH ISRAEL HOSPITAL

Monday

ALFRED A. SCHWARTZ—2. Clinic in neuro-otology.

Tuesday

JOSEPH W. MILLER—9. Bronchoscopic diagnostic clinic.
ERVIN TOROK, S. SLOUKA and FREDERICK NEWMAN—2. Eye clinic.

Wednesday

MARK GOTTLIEB—2. Ear surgery.
LAWRENCE D. REDWAY—2. Demonstration of colored photography of living eye.

Thursday

WILLIAM SPIELBERG—9. Rhinological surgery.
S. J. KOPETZKY—2. Otological operations.
ERVIN TOROK, S. SLOUKA and FREDERICK NEWMAN—2. Eye operations.

Friday

HAROLD J. ISAACS—2. Nose and throat clinic.

ST. LUKE'S HOSPITAL

Monday

WESTLEY M. HUNT—2. Nose and throat clinic.
ALFRED WIENER, ISAAC HARTSHORNE, CHARLES LITTWIN, HENRY SMITH and RAYMOND E. MEEK—2. Eye clinic.

Tuesday

CARL M. SAUTTER—2. Ear clinic.
L. T. PERRAULT and W. M. HUNT—2. Bronchoscopic clinic.
ALFRED WIENER, ISAAC HARTSHORNE, CHARLES LITTWIN, HENRY SMITH and RAYMOND E. MEEK—2:30. Eye operations.

Wednesday

A. P. VOISLAWSKY and staff—2. Nose and throat operations.
ALFRED WIENER, ISAAC HARTSHORNE, CHARLES LITTWIN, HENRY SMITH and RAYMOND E. MEEK—2. Eye clinic.

Thursday

WESLEY C. BOWERS and staff—2. Radical mastoid with primary skin graft.

Friday

ALFRED WIENER, ISAAC HARTSHORNE, CHARLES LITTWIN, HENRY SMITH and RAYMOND E. MEEK—2. Eye clinic.

LENOX HILL HOSPITAL

Thursday

JOHN KERNAN and G. F. OBERRENDER—9. Bronchoscopic clinic.
RUDOLF C. DENIG, JOHN J. REID and F. VINCENT GUINEE—2. Advancement (anchoring suture in corneal limbus); isolation of iris for incarcerated or prolapsed iris; transplantation of buccal mucous membrane; iridotorsion for glaucoma; treatment of postoperative infection.

FLOWER HOSPITAL

Thursday

J. A. W. HETRICK—2. Mastoid problems.
EDWIN S. MUNSON—2. Muscular imbalance of the eye.
WILLIAM MCLEAN—2. Cataracts (Barraquer technique).
ARTHUR CHAMBERS—2. Ophthalmological clinic.

MIDTOWN HOSPITAL

Monday

RAYMOND LOSEY—2. Ophthalmological surgery.

Tuesday

BENJAMIN FREUDENFALL—9:30. Nose and throat surgery.

ST. MARY'S HOSPITAL

Wednesday

JAMES W. BABCOCK—9. Ear, nose and throat conditions in children.

CORRECTION HOSPITAL

Monday

JAMES W. SMITH—2. Ophthalmic surgery.

Friday

JOSEPH ROSENBERG—9. Ear, nose and throat clinic.

HOSPITAL FOR JOINT DISEASES

Tuesday

ALFRED BRAUN—10:45. Ear, nose and throat operations.

SPECIAL CLINICS FOR BROOKLYN-LONG ISLAND DAY—WEDNESDAY

BROOKLYN EYE AND EAR HOSPITAL

R. L. MOORHEAD and staff—9. Operations: Simple and radical mastoid; sinus operations, local and general anæsthesia; tonsillectomy and adenoidectomy, local and general anæsthesia; bronchoscopy.

JOHN N. EVANS—9. Fundus cases; slit lamp demonstration; research laboratory demonstration.

DR. DEVERE—9. Pathological demonstrations.

CHARLES FRANKENBURGER—9. Problems of anaphylaxis; pathological specimens; old ophthalmological works.

GEORGE BARTISCH—9. Old German ophthalmology.

JOHN OHLY—9. Lantern slide demonstration.

RALPH I. LLOYD—9. Proptosis as a diagnostic problem.

THURMAN GIVEN and staff—9. Syphilis and the eye.

DR. DEVERE—2. Pathological demonstrations.

DRS. CRANE, LASHER, BRAISLIN, COLLINS, SCOFIELD, DURKEE, ADDOMS, POOL, TUCKER, HERBERT, CAMERON, MCCAMMON, AUWERDA, and DEYOANNA—2. Demonstration of cases of laryngectomy, artificial larynx, brain abscess, meningitis, petrositis.

R. RENDICH—2. Problems of anaphylaxis; pathological specimens; X-ray diagnosis and pathology of the mastoid and petrous pyramid; posterior sinuses; and optic canal.

THURMAN GIVEN and staff—2. Syphilis in children.

P. CHALMERS JAMESON—2. Recession operation.

JOHN OHLY—2. Cataract.

JAMES H. ANDREWS—2. Glaucoma operations.

E. CLIFFORD PLACE—2. General ophthalmic surgery.

DRS. REYNOLDS, WAUGH, BISHOP, BEERY, and HARGITT—2. Ophthalmological surgery.

ST. MARY'S HOSPITAL

Staff—9. Ear, nose and throat operations.

H. F. WILKINSON—2. Pathology of 10,000 pairs of tonsils.

ST. JOHN'S HOSPITAL

(Long Island City)

PATRICK J. KENNEDY—1. Secondary operation for mastoid; new technique in removal of septum.

LUTHERAN HOSPITAL

A. GILLIGAN, P. KEIL, L. M. MACDOUGALL, G. T. POLK, J. E. STACK, and M. SKINNER—9. Ear, nose and throat clinic.

A. GILLIGAN and G. T. POLK. Bronchoscopy; nasal sinus surgery; ear functional tests.

P. KEIL and J. E. STACK. Tonsillectomy under local anæsthesia; submucous resection; nasal sinus diagnosis.

L. M. MACDOUGALL and M. SKINNER. Tonsil and adenoid clinic; mastoidectomy; nasal surgery.

ST. PETER'S HOSPITAL

JOHN HAUFF. Treatment of the faucial tonsil by physiotherapy.

ALBERT KEENAN. Conservative treatment of diseases of the accessory nasal sinuses.

WYCKOFF HEIGHTS HOSPITAL

KARL MUELLER, JR.—2. Diathermic treatment of tonsils.

CUMBERLAND HOSPITAL

F. H. LASHER and staff—2. Symposium on diseases of the ear, nose and throat.

NORTH COUNTRY COMMUNITY HOSPITAL

(Glen Cove)

G. H. COX, L. T. JACKMAN, and DR. SCOTT—12. Nose and throat clinic.

CONEY ISLAND HOSPITAL

T. B. WOOD. Cerebral complications of otitis media.

BROOKLYN HOSPITAL

C. G. CRANE, J. H. TAYLOR, and F. H. LASHER—2. Nose and throat operations.

BUSHWICK HOSPITAL

L. C. MENGER and staff—9. Ear, nose and throat operations.

CLINICS IN BROOKLYN AND LONG ISLAND HOSPITALS

JEWISH HOSPITAL

Tuesday

EDWARD L. BERGER—2. Nose and throat operations.

Thursday

EDWARD L. BERGER—2. Nose and throat operations.

Friday

PHILIP LEIBOWITZ—2. Nose and throat operations.

ST. JOHN'S HOSPITAL

Tuesday

JOHN P. BAKER—2. Otolaryngology.

Thursday

JOHN P. BAKER—2. Otolaryngology.

Friday

ROBERT L. MOORHEAD—2. Otolaryngology.

WYCKOFF HEIGHTS HOSPITAL

Tuesday

ROBERT L. MOORHEAD—2. Nose and throat clinic.
CARL MUELLER, SR—3. Ophthalmological operations.

Thursday

ROBERT L. MOORHEAD—2. Nose and throat clinic.
CARL MUELLER, SR.—3. Ophthalmological operations.

Friday

CARL H. MUELLER, JR.—2. Nose and throat clinic.
IRVING CAMERON—3. Nose and throat clinic.

CALEDONIAN HOSPITAL

Tuesday

JOHN W. DURKEE—2. Otology.

Thursday

JOHN W. DURKEE—2. Otological operations.

LONG ISLAND COLLEGE HOSPITAL

Tuesday

C. W. STICKLE—2. Laryngology.
H. M. SMITH—2. Ophthalmology.

CUMBERLAND HOSPITAL

Tuesday

JOHN H. BAILEY and staff—2. Eye clinic, operations and demonstration of cases.

MARY IMMACULATE HOSPITAL
(Jamaica)

Tuesday

DANIEL S. CUNNING—9. Nose and throat clinic.

NASSAU HOSPITAL
(Mineola)

Friday

H. B. SMITH—9. Nose and throat clinic.

ST. JOHN'S HOSPITAL
(Long Island City)

Friday

P. J. KENNEDY and staff—2. Bronchoscopy.

LUTHERAN HOSPITAL

Tuesday

A. GILLIGAN—9. Otolaryngology.

Thursday

A. GILLIGAN—9. Otolaryngology.
LEON W. GREEN—2. Ophthalmological clinic.

Friday

PETER KEIL—9. Otolaryngology.

ST. PETER'S HOSPITAL

Tuesday

A. KEENAN—2. Nose and throat clinic.

Thursday

M. G. GOLDEN—2. Nose and throat clinic.

ST. CATHERINE'S HOSPITAL

Tuesday

S. H. DECOSTE—2. Ear, nose and throat clinic.

Thursday

G. GARTHWAITE FISHER—2. Ear, nose and throat clinic.

BROOKLYN HOSPITAL

Friday

C. G. CRANE—2. Ear, nose and throat operations and bronchoscopic clinic.

METHODIST EPISCOPAL HOSPITAL

Friday

C. L. STONE, C. A. ANDERSON, E. A. SUNDE, and H. GLEDHILL—2. Otolaryngology.

KINGS COUNTY HOSPITAL

Tuesday

J. W. DURKEE and M. G. GOLDEN—9. Otolaryngology.

NORTH COUNTRY COMMUNITY HOSPITAL
(Glen Cove)

Friday

G. H. COX—9. Nose and throat operations.

JAMAICA HOSPITAL
(Richmond Hill)

Thursday

A. J. SHEKTER—2. Eye, ear, nose and throat clinic.